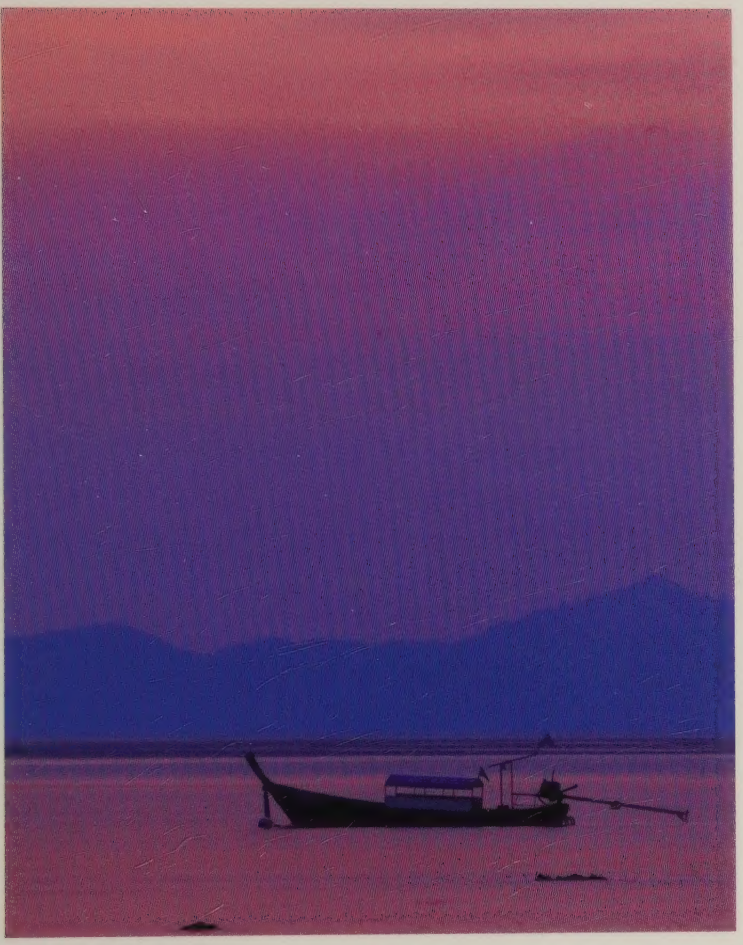

Wooden Shipbuilding: A Comprehensive Manual for Wooden Shipbuilders

W. J. Thompson

Wooden Shipbuilding

A Comprehensive Manual for Wooden Shipbuilders to Which is Added a Masting and Rigging Guide

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Part I

Wooden Ships

Wooden Shipbuilding

A

Afloat.— Borne up by, or floating in, the water.

After-Body.— That part of a ship's body abaft the midships, or dead-flat. This term is more particularly used to describe the figure or shape of that part of the ship.

After-Hood.— The after-most plank in a strake.

After-Rake.— The overhang of the stern.

After-Timbers.— All those timbers abaft the midships or dead-flat.

Air Funnel.— An air funnel is an opening framed between the clamp strake and the floor to admit air to the air-courses, which are spaces from four to six inches wide, between each set of frame timbers, or between sets at regular intervals, and extend from side to side of the ship. Such spaces are sometimes left open between ceilings and floors. Their purpose is to prevent decay by providing for the passage of

air through the ship. Air-course boards are used to close these spaces.

Aluminum for Shipbuilding.— The annual report of the British Aluminum Association, as printed some years ago in the *London Times*, contained the following comment: "A good deal has been said with regard to the injurious action of sea water on aluminum, but the Board knew by long experience that aluminum did not deteriorate in salt water to the extent that had been alleged. The yacht *Defender* was built very largely of aluminum, and after four and one-half years she was found to have deteriorated so little that very few repairs were necessary to put her into condition to compete with the *Columbia* at the recent trials. Torpedo boats and other boats, moreover, had been built in France partly of aluminum. As aluminum was only one-third the weight of copper, it was apparent that about one-half the quantity of aluminum gave a corresponding amount of electrical conductivity to that given by copper. Lord Kelvin said that in the fitting of ships aluminum had proved valuable, convenient, and of great practical utility. As to the actual construction of ships with aluminum, that was a matter which would have to be settled by the experience of engineers. He did not believe that the question of the efficiency of protecting aluminum by paint had yet been gone into sufficiently. If they compared an unprotected aluminum plate with steel or

iron, he thought it would be found that the former did not rust away as quickly as the latter."

Amidships.— In midships, or in the middle of the ship, either with regard to her length or breadth. Hence that timber or frame in the ship which has the greatest breadth and capacity is denominated the midship bend.

Anchor-Lining.— The short pieces of plank, or board, fastened to the sides of the ship, or to stanchions under the fore-channel to prevent the bill of the anchor from wounding the ship's sides when fishing the anchor. To anchor-stock is to work planks in a manner resembling the stocks of anchors, by fashioning them in a tapering form from the middle and working or fixing them over each other so that the broad or middle part of one plank shall be immediately above or below the butts or ends of two others. This method, as it occasions the use of much timber, is only used where particular strength is required, as in spirketings under ports, etc.

Apron.— A strong piece of timber fitted on the inner side of the stem, to which it is bolted; in large vessels it is composed of several pieces joined together.

B

Beam.— Beams are timbers spanning a vessel from side to side, the ends being firmly attached thereto by hanging and lodging knees, thus connecting the two sides of the ship. The siding and molding are usually regulated by the length of the midship beams. In a vessel about twenty feet broad they are usually eight to ten inches; in one of double that breadth, from twelve to fifteen inches square. The molding near the ends is generally a trifle less than at the middle line. The spacing of deck beams is from four feet to four feet six inches. Hold beams are usually heavier than deck beams, and spaced farther apart. The molding of a beam is its depth. The siding of a beam its breadth.

Beveling Board.— A piece of pine the width of the vertical flange of the harpin, having on it the bevels taken at each frame, is supplied with the mold. Holes are punched in the vertical flange for temporary attaching to the frames. The position of the harpin is also marked on the frames and stem when they are turned so that there is no difficulty in placing the harpin in its right position on the ship.

Bilge.— The curved or flat or nearly flat part of a ship's bottom, outside or inside.

Bilge Diagonal.— A bilge diagonal represents the shape of an oblique longitudinal plane, extending from the center line of the vessel to the turn of the bilge on the midship frame.

Bitt.— A bitt is a post or vertical timber, usually fastened in pairs to one or more decks, to which cables, etc., are made fast, or to support a windlass or the like.

Black-Strake.— A term applied to the strake of planking next above the wales.

Bobstay.— A piece of wood forming part of the knee of the head, to which the lower end of the bobstay is sometimes connected, is more properly called the bobstay-piece; while the bobstay proper is a chain or rope from the end of the bowsprit to the stem, to counteract the strain of the forestays.

Body Plan.— The body plan is the shape of the vessel at transverse vertical planes, at different frame stations in the length, taken square to the keel and the center line, upon which is also indicated the decks, rail, and knuckle.

Body-Post or Propeller-Post.— The post at the forward end of the screw-shaft opening in the deadwood.

Bolts.— Strong copper, iron, or yellow metal pins, employed in great numbers for binding and fasten-

ing together the different planks and timbers of which a vessel is constructed. Their specific names depend upon their location, as follows: Bilge bolts, those attaching the inside and outside bilge planking to the frames. Breast-hook bolts, those by which a breast-hook is fastened to the frames, or to the apron, or stem. Butt-end bolts, bolts driven through the end of an outside plank, a timber, and an inside plank, and clinched to the latter or vice versa. Cant-timber bolt, a bolt driven through the heel of a cant-frame and the dead-wood. Chain bolts, bolts by which the chain plates are fastened to the vessel's side. Clamp bolts, employed in fastening a clamp to the timbers. Channel bolt, one by which a channel is bolted to the ship's side. Clinched bolt, any bolt having a head on one end and clinched when driven home. Some clinched bolts are called drift-bolts. Crutch bolt, one fastening a crutch to the sternpost or frames of the vessel. Dead-wood bolt, employed to fasten dead-wood to the keel. Deck bolts, used to fasten deck planks to the beams. Deck-binding bolts, used to fasten the spirketings, waterways, shelves, etc., to the vessel's side and to each other. Deck-hook bolts, used to fasten deck-hooks. Dump bolt, one of short length and not extending through the material with which connected. Eye bolt, having an eye at one end. Frame bolts, used to tie frames together horizontally. Garboard bolts, employed to fasten the garboard strakes to the keel and to the floors. In-an-out bolts, those

driven from the outside through the outside planking, timber and inside planking, or vice versa. Keelson bolts, those driven through the keelson, floor, and keel to connect those parts. Sister-keelson bolts, employed to fasten a sister-keelson horizontally to the middle-line keelson, and vertically to the floors. Keel-scarph bolts, those by which the keel-pieces are connected. Knee bolts, those used to fasten either a hanging or lodging knee. Limber-strake bolts, used to fasten a limber strake to the floors. Nut bolt, having a head on one end and a nut on the other. Pointer bolt, one used to connect a pointer to a vessel's side, to a beam-end, a breast-hook, or a crutch. Preventer bolt, used to attach a preventer plate to the vessel's side. Rider bolt, used to fasten a rider. Ring bolts, eye bolts into which a ring is fastened. Rudder-brace bolt, used in fastening a rudder brace to the sternpost and to the after-hoods of the outside planking. Rudder-pintle bolts, used to fasten the metal strap in connection with the rudder pintle to the rudder. Shelf bolt, used to fasten shelves to the ship's sides. Stemson bolts, those fastening a stemson to the apron. Sternson bolts, used to connect a sternson to the sternpost, or inner post. Throat bolts, those driven through the throat of a knee, a hook, etc. Through bolts, those that pass through the pieces they connect. Transom bolts, bolts by which a transom is connected to the stern timbers of a ship. Up-and-down bolts, driven up downward and vice versa. Waterway bolts, those

by which a waterway is fastened to the frames and beam-ends of a vessel.

Boot-Topping.— This is the term given to a wood sheathing which is fitted between the light and deep water lines on the outside planking of a vessel. It is fitted either above a low metal sheathing as a protection from the sea-worm, or sometimes underlying the upper portion of such sheathing. The object is to cover the metal bolt-heads, and thus prevent the destructive action which would be caused by their contact with the copper or yellow metal sheathing.

Bow Line.— A curve showing a vertical section of a vessel's bow in the profile or sheer, forward of midships; the molded shape of the ship at a vertical plane parallel to the longitudinal center line.

Bowsprit.— A spar projecting forward and usually slightly upward from the bow of the vessel, resting upon the stem and the apron, supporting the jib boom and the flying jib boom of a ship.

Boxing of Keel and Stem.— The scarph that unites the lower end of the stem to the fore end of the keel.

Bulkhead.— One of various partitions in a vessel which separate it into desired rooms or divide the hold into water-tight compartments. A collision bulkhead is sometimes placed across the bows of a

ship to prevent further influx of water if the bows are stove in.

Bulwark.— The bulwarks of a wooden vessel comprise the bulwark stanchions, bulwark planking, and a rail, which form together a kind of palisade around an upper deck, a poop deck, a raised quarter-deck, etc., varying from two to six feet in height, according to the size of the vessel and the purpose for which it is intended. The main bulwark is the one fitted around the upper deck. The topgallant bulwark is one of small height, fitted on top of the main bulwark.

Butt-Chocks.— Short pieces of wood which are used to connect the heads and heels of frame timbers.

Buttock.— A buttock is similar to a bowline, being a continuation of it and applying to the part abaft of the midship frame.

Buttocks.— The plural of buttock.

C

Camber of Beam.— The camber of beam is the "round-up" of the deck, sometimes called the crop, and is usually one-fourth of an inch to the foot.

Cant.— A term used with reference to the inclination that anything has from a square or perpendicular. To cant is to level or shape.

Cant Ribbands.— Those ribbands that do not lie in a horizontal or level direction, or square with the middle line, but are nearly square with the timbers, as the diagonal ribbands.

Cant Timbers.— Cant timbers are those timbers afore and abaft whose planes are not square with, or perpendicular to, the middle line of the ship.

Caps.— Those square pieces of oak, laid upon the upper blocks, on which the ship is built, to receive the keel. They should be of the most freely grained oak, that they may be easily split out when the false keel is to be placed beneath. Their depth may be a few inches more than the thickness of the false keel, that it may be set up close to the main keel by slices, etc.

Cap-Scuttle.— This is a framing composed of coamings and head ledges, raised above the deck, with a flat or top which struts or fits closely over into a rabbet.

Carlings or Carlines.— These are long pieces of timber, above four inches square, which lie fore-and-aft, in tiers, from beam to beam, into which their ends are scarphed. They receive the ends of the ledges for framing the decks. The carlings by the side of, and for the support of the masts, which receive the framing around the masts, called the part-

ners, are much larger than the rest, and are named the mast carlings. Besides these are others, such as the pump carlings, which go next without the mast carlings, and between which the pumps pass into the well; and also fire-hearth carlings, that let up under the beam on which the galley stands, with pillars underneath and chocks upon it, which are fayed up to the edges for support.

Carvel Work.— This is a term applied to cutters and boats in which the seams of the bottom planking are square, and are to be made tight by calking as those of ships. It is opposed to the phrase "clincher built," which see.

Calking.— Calking is the forcing of oakum into the seams and between the butt of the plank, etc., with iron instruments in order to prevent the water penetrating into the ship.

Ceiling or Foot-Waling.— The inside planks of the bottom of the ship.

Cellular Double Bottoms.— Most screw steamers and some large sailing ships are made with double bottoms to carry water ballast. The double bottom is accessible by manholes through the floors in different places.

Center of Cavity or of Displacement.— The center of that part of the ship's body which is immersed

in the water, and which is also the center of the vertical force that the water exerts to support the vessel.

Center of Gravity.— The point about which all the the parts of a body, in any situation, exactly balance each other; hence, (1) If a body is suspended by this point as the center of motion it will remain at rest in any position indifferently. (2) If a body be suspended by any other point, it can rest only in two positions, viz.: when the center of gravity is exactly above or below the point of suspension. (3) When the center of gravity is supported, the whole body is kept from falling. (4) Because this point has a constant tendency to descend to the center of the earth; therefore: (5) When the point is at liberty to descend, the whole body must also descend, either by sliding, rolling, or tumbling over.

Center of Lateral Resistance (see Lateral Resistance).

Center of Motion.— That point of a body that remains at rest while all the other parts are in motion about it. It is the same as the center of gravity in bodies that are of uniform density throughout.

Center of Oscillation.— That point in the axis or line of suspension of a vibrating body or system of bodies in which, if the whole matter or weight be collected, the vibration will still be performed in the

same time and with the same angular velocity as before.

Center of Percussion.— In a moving body, this is that point where the percussion or stroke is the greatest and in which the whole percutient force of the body is supposed to be collected. Percussion is the impression which a body makes in falling or striking upon another, or the shock of bodies in motion striking against each other. It is direct or oblique: direct when the impulse is given in a line of perpendicular to the point of contact, and oblique when it is given in a line oblique to the point of contact.

Center of Resistance to Fluid.— That point in a plane to which, if a contrary force be applied, it will just sustain the resistance.

Chain or Chains.— The links of iron which are connected to the binding that surrounds the dead-eyes of the channels. They are secured to the ship's side by a bolt through the toe-link, called a chain bolt.

Chain Bolt.— A large bolt to secure the chains of the dead-eyes, for the purpose of securing the masts by the shrouds.

Chain Plates.— Thick iron plates, which are bolted to the ship's sides, sometimes used instead of chains to the dead-eyes, as above.

Chamfering.— Taking off the sharp edge of timber or plank, or cutting the edge or end of anything bevel or aslope.

Change of Frames.— The bosom of the fore-body frames look toward the midships, and the after-body frames do the same. The change takes place on the midship frame. This is done because of the excessive bevel which would occur at one end if they all looked the same way, preventing the riveting of the shell flange.

Channels.— The broad projections or assemblages of planks, which are fayed and bolted to the ship's sides for the purpose of spreading the shrouds with a greater angle to the dead-eyes. They should therefore be either above or below the upper deck ports, as may be most convenient. But it is to be observed that, if placed too high they strain the sides too much; and if placed too low the shrouds cannot be made to clear the ports without difficulty. Their disposition will therefore depend on that particular which will produce the greatest advantage. They should fay to the sides only where the bolts come through and have an open space of about two inches in the rest of their length to admit of a free current of air and form a passage for water and dirt in order to prevent the sides from rotting.

Channel Wales.— Three or four thick strakes, worked between the upper and lower deck ports in

two-decked ships, and between the upper and middle deck ports in three-decked ships, for the purpose of strengthening the topside. They should be placed in the best manner for receiving the chain and preventer bolts, the fastenings of the deck knees, etc.

Cheeks.— These are knees of oak timber which support the knee of the head, which are also ornamented by their shape and moldings. They form the basis of the head and connect the whole to the bows, through which, and the knee, they are bolted.

Chestrees.— Pieces of oak timber fayed and bolted to the topsides, one on each side, abaft the fore channels, with a sheave fitted in the upper part for the convenience of hauling home the main tack.

Chine.— That part of the waterways that is left the thickest above the deck plank. It is bearded back that the lower seam of the spirketing may be more conveniently calked, and is gouged hollow in front to form a water course.

Chinse.— To chinse is to calk slightly with a knife or chisel those seams or openings that will not bear the force required to calk in a more proper manner.

Chocks.— Blocks or pieces of timber of different shapes, which are employed for various purposes, and called bow-chock, butt-chock, floorhead-chock, etc.

Clamps.— Those substantial strakes worked inside the ship upon which the ends of the beams are placed.

Classification Registry Depth.— This is taken from the top of the keel to the top of midship beam at the center line, except that in spar and awning-decked vessels it is taken to the main deck.

Classification Registry Length.— This is taken on the level of the upper deck from the inside of the stem to the inside of the sternpost.

Clean.— A term generally used to express the acuteness or sharpness of a ship's body, as when a ship is formed very acute or sharp forward and the same aft, she is said to be clean forward and aft.

Clincher Built.— A term applied to the method of construction of vessels and boats when the planks of the bottom are so disposed that the lower edge of every plank overlays the next under it, and the fastenings go through and clinch or turn upon the timbers. It is opposed to the term "carvel work."

Clinching or Clenching.— Spreading the point of the bolt upon a ring, etc., by beating it with a hammer in order to prevent its drawing.

Coaking.— To unite by coaks or tenons on the faces of the timbers to be joined; or, to unite pieces

of spar by means of tubular projections, formed by cutting away the solid of one piece into a hollow, so as to make a projection on the other in such a manner that they may fit correctly, the butts preventing the pieces from drawing asunder. Coaks are fitted into beams and knees of vessels to prevent their drawing.

Coaming.— The raised border of oak about the edges of the hatches and scuttles, which prevents water from flowing down from off the deck. Its inside upper edge has a rabbet to receive gratings.

Companion.— In ships of war it is the framing and sash lights upon the quarter-deck or poop through which the light passes to the commander's apartments. In merchant ships it is the birthing or hood around the ladder-way leading to the master's cabin, and in small ships is chiefly for the purpose of keeping the sea from beating down.

Compass Timbers.— Such as are curved or arched.

Conversion.— The art of lining and molding timber, plank, etc., with the least possible waste.

Coping.— Turning the ends of iron lodging knees so they may hook into the beams.

Counter.— A part of the stern, the lower counter being that arched part of the stern immediately

above the wing transom. Above the lower counter is the second counter, the upper part of which is the under part of the lights or windows. The counters are parted by their rails, as the lower counter springs from the tuck-rail, and is terminated on the upper part by the lower counter rail. From the upper part of the latter springs the upper or second counter, its upper part terminating in the upper counter rail, which is immediately under the lights.

Counter Rail.— One of the ornamental rails across a vessel's stern, with which the counters merge.

Counter Sunk or Counter Sink.— The hollows in iron plates, etc., which are excavated by an instrument called the counter-sunk bitt, to receive the heads of screws or nails so that they may be flush or even with the surface.

Counter Timbers.— The right-aft timbers which form the stern. The longest run up and form the lights, while the shorter only run up to the under part of them, and help to strengthen the counter. The side counter timbers are generally formed of two pieces scarphed together in consequence of their peculiar shape, as they not only form the right-aft figure of the stern, but partake of the shape of the topside also.

Cove.— The arch molding sunk in at the foot or lower part of the taffarel.

Crab.— A sort of little capstan formed by a kind of wooden pillar, whose lower end works in a socket, while the middle traverses or turns around in partners, which clip it in a circle. In its upper end are two holes to receive bars, which act as levers, and by which it is turned around, serving as a capstan for the raising of weights, etc. By a machine of this kind, so simple in its construction, may be hove up the frame timbers, etc., of vessels when building. For this purpose it is placed between two floor timbers, while the partners which clip it in the middle, may be four or five inch plank fastened on the same floor. A block is fastened beneath in the slip with a central hole for its lower end to work in. Besides the crab there is another kind which is shorter and portable. The latter is fitted in a frame composed of cheeks, across which are the partners, and at the bottom is a little platform to receive the spindle.

Cradle.— A strong frame of timber, etc., which is placed under the bottom of a ship in order to conduct her steadily in her ways till she is safely launched into water sufficient to float her.

Crank.— A term applied to ships which have been built too deep in proportion to their breadth, and which are as a consequence in danger of oversetting.

Croaky.— A term applied to plank, when short lengths curve or compass much.

Cross Chocks.— Pieces of timber fayed across the dead-wood, amidships, to make good the deficiency of the heels of the lower futtocks.

Cross Pauls.— Pieces of timber that keep a vessel together while in frame.

Cross Piece.— A piece of timber connecting two bitts.

Cross Spales.— Deals of fir plank nailed in a temporary manner to the frames of a ship at a certain height, and by which the frames are kept to their breadths, until the deck knees are fastened. The main and top timber breadths are the heights mostly taken for spalling the frames, but the height of the ports is much better, yet this may be found too high if the ship is long in building.

Crutches or Clutches.— The crooked timbers fayed and bolted upon the foot-waling abaft for the security of the heels of the half timbers. Also stanchions of iron or wood whose upper parts are forked to receive rails, spare masts, yards, etc.

Cup.— A solid piece of cast iron let into the step of a capstan, in which the iron spindle at the heel of the capstan works.

Cutting-Down Line.— The elliptical curve line forming the upper side of the floor timbers at the

middle line. Also, the line that forms the upper part of the knee of the head above the cheeks. The cutting-down is represented as limiting the depth of every floor timber at the middle line, and also the height of the upper part of the dead-wood afore and abaft.

Cutwater.— A piece of timber bolted to the fore side of a stem, extending from near the knee of the head down to the gripe, or to the keel, as the case may be; and thus cutting the water when the vessel is in progress. Ordinarily, however, the term cutwater is applied to the knee of the head itself.

D

Dagger.— A piece of timber that faces onto the poppets of the bilge ways and crosses them diagonally to keep them together. The plank that secures the heads of the poppets is called the dagger plank. The word dagger seems to apply to anything that stands diagonally or aslant.

Dagger Knees.— Knees used to supply the place of hanging knees. Their side arms are brought up aslant, or nearly so, to the under side of the beam adjoining. They are chiefly used in connection with the lower deck beams of merchant ships, in order to preserve as much stowage in the hold as possible.

Any straight-hanging knees not perpendicular to the side of the beam are in general termed dagger knees.

Dead-Flat.— A name given to that timber or frame which has the greatest breadth and capacity in the ship, and which is generally called the midship bend. In those ships where there are several frames or timbers of equal breadth or capacity, that which is in the middle should always be considered as dead-flat, and distinguished as such by this character +. The timbers before the dead-flat are marked A, B, C, etc., in order; and those abaft the dead-flat by the figures 1, 2, 3, etc., while the timbers adjacent to the dead-flat and of nearly the same dimensions, are distinguished by the characters, (A), (B), and (1), (2), etc.

Dead Rising or Rising Line of the Floor.— Those parts of the floor or bottom throughout the ship's length where the sweep or curve at the head of the floor timber is terminated or inflects to join the keel. Hence, although the rising of the floor at the midship flat is but a few inches above the keel at that place, its height forward and aft increases according to the sharpness of form in the body. Therefore, the rising of the floor in the sheer plan is a curved line drawn at the height of the ends of the floor timbers, and limited at the main frame or dead-flat by the death-rising, appearing in flat ships nearly parallel to the keel for some timbers afore and abaft

the midship frame, for which reason these timbers are called flats; but in sharp ships it rises gradually from the main frame, and ends on the stem and post.

Dead Water.— The eddy water which the ship draws after her at her seat or line of floating in the water, particularly close aft. To this particular great attention should be paid in the construction of a vessel, especially those with square tucks; for such, if carried too low in the water, will be attended with great eddies, or much dead water. Vessels with round buttocks have but little or no dead water, because by the rounding or arching of such vessels abaft, the water more easily recovers its state of rest.

Dead-Wood.— That part of the basis of a ship's body forward and aft which is formed by solid pieces of timber, scarphed together lengthways on the keel. These should be sufficiently broad to admit of a stepping or rabbet for the heels of the timbers, that the latter may not be continued downward to sharp edges; and they should be sufficiently high to seat the floors. Afore and abaft the floors the dead-wood is continued to the cutting-down line for the purpose of securing the heels of the cant timbers.

Depth in the Hold.— The height between the floor and the lower deck. This is one of the principal dimensions given for the construction of a ship. It varies according to the height at which guns are

required to be carried from the water in war ships, or according to the trade for which a vessel is designed.

Designing.— The art of designing, as distinguished from making a block model by the eye and building a boat from it, first attracted public attention about forty years ago. At this time the iron cutter yacht *Vindex* was brought out. The *Vindex* was designed on a drawing board and the lines made to the outside of the plank, while the displacement, center of gravity of the same, center of lateral resistance, and various other particulars of construction were calculated before the model was made, and it was not until these matters were settled that the model was made; but the boat was actually built from the lines as drawn. Shortly after this, other boats were built after the new method, and though the battle was fought by the model-makers with great vigor, the new method has conquered and now naval architecture is a fashionable profession. The drawing-board method is to assume a load water line, and all the other dimensions are proportionate to this dimension. The plan is drawn to the outside of plank, and the model, when made free from the lines, is exactly like the proposed boat. The displacement, center of gravity of the same, center of lateral resistance, areas of cross section, and other particulars are all predetermined points. This seems to be but common sense, but the block-model system was so strongly

intrenched in the affections of yachtsmen that no amount of ridicule was enough to heap on the heads of the "paper-boat builders."

Diagonal Line.— A line cutting the body plan diagonally from the timbers to the middle line. It is square with, or perpendicular to, the slope of the timbers, or nearly so, till it meets the middle line.

Diagonal Ribband.— A narrow plank made to a line formed on the half-breadth plan, by taking the intersections of the diagonal line with the timbers in the body plan to where it cuts the middle line in its direction, and applying it to their respective stations on the half-breadth plan, which forms a curve to which the ribband is made as far as the cant body extends, and the square frame adjoining.

Displacement.— The weight of water displaced by the bottom and sides of a vessel below the water line. The displacement is a predetermined quantity and time and care are taken to figure it correctly. One way is to set off at the station of cross section the area in linear feet on a small scale for convenience; then make a curve of versed sines for the forward body; the after body being a trochoidal curve, based upon a radius of one-tenth of the length of the after body. A curve is drawn to take in these points and the L. W. L. divided up by ordinates and a calculation made of the contents. As the linear feet

at cross section represents the area of that section, so does every point in the curve represent the area of a section at that point, and the result of the calculation is the half displacement. It has been found that the displacement, as shown on this curve, comes very close to that of the best boats and may be accepted as a law. This method was outlined by Mr. John Hyslop of New York, about the time that it was presented to the public by Mr. Colin Archer of Norway, and we are indebted to the labors of these gentlemen for a displacement shown on one line. The theory is that the line of least resistance is a curve of versed sines for the fore body and a trochoidal curve for the after body, and this idea is applied to the cross sections and not to the water line. For though there have been large vessels that had a true versed sine curve below the water line, no rule could be given as to how much or how little should be taken off the line end of the curve for a water line for a small boat; moreover, this line could only be applied to a boat of great beam and shallow body, and this type of model is a poor sea boat and unsafe. If the displacement should be too small, a larger cross section must be made and the curve projected anew and a new calculation made. The draught of water, power to carry sail, and general behavior of the boat depends upon the displacement.

Dog.— An iron implement used by shipwrights. It has a fang at one or both ends which may be

driven into any piece of timber to support it while hewing, etc. Another kind has a fang at one end and an eye in the other in which a rope may be fastened and used to haul things.

Dog Shore.— A shore particularly used in launching.

Doubling.— Planking a ship's bottom twice. It is sometimes done on new ships when the original planking is thought to be too thin, and in repairs it strengthens the ship without having to drive out the former fastenings.

Doweling.— A method of coaking by letting pieces into the solid, or uniting pieces together by tenons.

Draught.— The drawing or design of the ship upon paper describing the different parts from which the ship is to be built. It is usually drawn on a scale of one-quarter of an inch to a foot, so divided or graduated that the dimensions may be taken to one inch.

Draught of Water.— The depth of water a ship displaces when she is afloat.

Drifts.— This term is sometimes applied to the place where the sheer is raised and the rails cut off, and also to the scroll pieces with which the rails are

ended, by others called drift pieces. Also the difference between the diameter of a mast and its encircling hoop, or between a hole and the treenail driven into it.

Driver.— The foremost spur on the bilge ways, the heel of which is forged to the foreside of the foremost poppet, and cleated on the bilge ways. The sides of it stand fore and aft. Now seldom used.

Drumhead.— The head of a capstan formed of semicircular pieces of elm, which, framed together, form the circle into which the capstan bars are fixed.

Druxey.— A state of decay in timber with white spongy veins, the most deceptive of all defects.

Dumb-Chalder.— A metal cleat or block, bolted to the after side of a vessel's sternpost for the end of a rudder pintle to rest on. It relieves the rudder-braces by preventing the whole weight of the rudder from resting on them.

E

Edging of Plank.— Sawing or hewing it narrower.

Eking.— Making good the deficiency in the length of any piece by scarphing or butting, as at the end

of deck hooks, cheeks, or knees. The ekeing at the lower part of the supporter under the cathead is only to continue the shape and fashion of that part, and is of no other service. We make this assertion because if the supporter were stopped short without an ekeing it would be better. This ekeing causes the side to decay, and it commonly appears fair to the eye in but one direction. The ekeing is also the piece of carved work under the lower part of the quarter-piece at the aft part of the quarter-gallery.

Elevation.— The orthographic draught, or perpendicular plan, of a ship, whereon the heights and lengths are indicated. It is called by shipwrights the sheer draught.

Elliptical Stern.— An oval-shaped, overhanging stern.

End of the Stem Bar or Figure Step.— The bobstay is fastened on the end of the stem bar, which should terminate in such a position that the stay when fixed will clear the front, and yet allow sufficient to form a figure of six to eight feet in length.

Entrance.— A term applied to the fore part of the ship under the load-water line, as "She has a fine entrance," etc.

Even Keel.— A ship is said to be on an even keel when she draws the same quantity of water abaft as

forward; also when she has no list, and is not inclined by the head or stern.

F

Face Pieces.— Pieces of wood wrought on the fore part of the knee of the head.

Facing.— The rabbeting of one piece of timber into another in order to strengthen it.

Fair.— A term used to denote the evenness or regularity of a curve or line.

Fairness.— When the buttocks, bow, and sheer line in the profile, the level deck, knuckle, and boundary lines in the half-breadth, and the frame stations in the body, show continuous curves without abruptness the ship is fair; or when spots taken from any two plans and placed in the third show continuity without abruptness. Until this is the case there must be an interchange of spots from one plan to the other to secure agreement and fairness.

Falling Home or Tumbling Home.— The inclination which the topside has inward from a perpendicular.

False Keel.— A second keel, composed of elm plank or thick stuff, fastened slightly under the main keel

to prevent it from being rubbed. Its advantages also are that if the ship should strike the ground, the false keel will give way and the main keel will thus be saved. It will also be the means of causing the ship to hold the wind better.

False Post.— A piece tabled onto the after part of the heel of the main part of the sternpost. It is to assist the conversion and preserve the main post should the ship's tail go aground.

False Rail.— A rail fayed down upon the upper side of the main or upper rail of the head. It is to strengthen the head-rail, and forms the seat of ease at the after end next the bow.

Fashion Pieces.— The timbers so called because they fashion the after part of the ship in the plane of projection by terminating the breadth and forming the shape of the stern. They are united to the ends of the transoms and to the dead-wood.

Fastening.— The bolts and treenails, by which the numerous planks, timbers, etc., of a vessel are fastened and kept together. Some of the terms by which they are designated are single fastening, double fastening, double-and-single fastening, external fastening, inside fastening, dump fastening, through fastening, etc.

Fay.— To join one piece so close to another that there will be no perceptible space between them.

Felt.— Matted fibrous matter, which is produced in sheets and is used between the sheathing to prevent leaking and to protect from worms.

Figure-Head.— A figure or bust, which is fitted on the extremity of a knee of the head. Sometimes an inward turned, carved scroll is used; it is then called a fiddle figure-head.

Filling Timbers.— The intermediate timbers between the frames that are gotten up into their places singly after the frames are ribbanded and shored.

Finishing.— Carved ornaments of the quarter-gallery below the second counter and above the upper lights.

Flairing.— The reverse of falling or tumbling home. This can only be in the fore part of the ship. It is said that the ship has a flairing bow when the topside falls outward from a perpendicular. Its uses are to shorten the cathead, and yet keep the anchor clear of the bow. It also prevents the sea from breaking in upon the forecastle.

Flam.— The same as flairing.

Flats.— A name given to the timbers amidships that have no beveling and are similar to dead-flat, which is distinguished by this character + (see Dead-flat).

Floor.— The bottom of a ship, or all that part on each side of the keel which approaches nearer a horizontal than a perpendicular, and wheron the ship rests when aground.

Floors or Floor Timbers.— The timbers that are fixed athwart the keel and upon which the whole frame is erected. They generally extend as far forward as the foremast, as far aft as the after square timber, and sometimes one or two cant floors are added.

Flush.— A continued even surface, as a flush deck, which is a deck upon one continued line without interruption from fore to aft.

Foot-Waling.— The inside planks or lining of a vessel over the floor timbers.

Fore Channel.— The channel of the fore-shroud.

Fore Body.— That part of the ship's body afore the midships or dead-flat. This term is more particularly used with reference to the figure or shape of that part of the ship.

Forecastle.— That portion of the spar deck which is forward of the after fore-shroud.

Fore-Foot.— The foremost piece of the keel.

Fore-Lock.— A thin circular wedge of iron used to retain a bolt in its place by being thrust through a mortise hole in the end of the bolt. It is sometimes turned or twisted around the bolt to prevent its drawing.

Fore-Peak.— Close forward under the lower deck.

Frames.— The bends of timber which form the body of the ship, each of which is composed of one floor timber, two or three futtocks, and a top timber on each side, which, joined together, form the frame; of these frames or bends, that which encloses the greatest space is called the midship or main frame or bend. The arms of the floor timber form a very obtuse angle, and in the other frames this angle decreases or gradually becomes sharper fore-and-aft with the middle line of the ship. Those floors that form the acute angle afore and abaft are called the rising floors. A frame of timbers is usually formed by arches or circles called sweeps, of which there are generally five: (1) The floor sweep, which is limited by a line in the body plan perpendicular to the plane of elevation, a little above the keel; and the height of this line above the keel is called the dead rising. The upper part of this arch forms the head of the floor timber. (2) The lower breadth sweep, the center of which is in the line representing the lower height of breadth. (3) The reconciling sweep. This sweep joins the two former without in-

tersecting either, and makes a fair curve from the lower height of breadth to the rising line. If a straight line be drawn from the upper edge of the keel to touch the back of the floor sweep, the form of the midship frame below the lower height of breadth will be obtained. (4) The upper breadth sweep, the center of which is in the line representing the upper height of breadth of the timber. This sweep described upwards forms the lower part of the top timber. (5) The top timber sweep or back sweep, is that which forms the hollow of the top timber. This hollow is, however, very often formed by a mold, so placed as to touch the upper breadth sweep and pass through the point limiting the half-breadth of the top timber.

Frame Timbers.— The various timbers that compose a frame bend, as the floor timber, the first, second, third, and fourth futtocks, and top timber, which are united by a proper shift to each other, and bolted through each shift. They are often kept open for the purpose of securing a circulation of air, and fillings fayed between them in wake of the bolts. Some ships are composed of frames only, and are supposed to be of equal strength with others of larger scantling.

Freeboard.— The height of the side from water line to deck, or plank sheer.

Futtocks.— The separate pieces of timber of which the frame timbers are composed. They are named according to their location; that nearest the keel is called the first futtock; the next above, the second futtock, etc.

G

Garboard Strake.— That strake of the bottom which is wrought next the keel and rabbets therein.

Graving-Piece.— A small piece of wood inserted in a deck plank in place of a damaged or decayed spot.

Gripe.— A piece of elm timber that completes the lower part of the knee of the head and makes a finish with the fore-foot. It bolts to the stem, and is further secured by two plates of copper in the form of a horseshoe, and is therefore called by that name.

Ground Ways.— Large pieces of timber, generally defective, which are laid upon piles driven in the ground, across the dock or slip in order to make a good foundation for the block upon which the ship is to rest.

Gudgeons.— The braces on the sternpost on which the rudder hangs.

Gunwale.— That horizontal plank which covers the heads of the timbers between the main and fore drifts.

H

Half-Breadth Plan.— A ship construction drawing showing the rail line, plank sheer line, and all water lines as curves, and the ending of all lines in the sheer plan are squared down to their respective planes in the half-breadth plan.

Half-Timbers.— The short timbers in the cant bodies which are answerable to the lower futtocks in the square body.

Hanging Knees.— Those knees against the sides of the vessel the arms of which hang vertically or perpendicularly.

Harpins.— Pieces of oak, similar to ribbands, but trimmed and beveled to the shape of the body of the ship, and holding the fore-and-aft cant bodies together until the ship is planked. But this term is most applicable to those at the bow, hence arises the phrase " lean and full harpins," as the ship at this part is more or less acute.

Head.— The upper end of anything, but more particularly applied to all the work fitted afore the stem, as the figure, the knee-rails, etc. A " scroll head " means that there is no carved or ornamental figure at the head, but that the termination is formed

and finished off by a volute or scroll turning outwards. A "fiddle head" is a similar kind of finish, but with the scroll turning aft or inwards.

Head-Ledges.— The thwartship pieces which frame the hatchways and ladder ways.

Head-Rails.— Those rails in the head which extend from the back of the figure to the cathead and bows, which are not only ornamental to the frame but also useful to that part of the ship.

Heel.— The lower end of a tree, timber, etc. A ship is said to heel when she is not upright but inclines under a side pressure.

Helm Port Transom.— A piece of timber which is placed across the lower counter on the inside of the height of the helm port, and bolted through every timber for the security of that part.

Hogging (Broken-backed).— A ship is said to hog when the middle part of her keel and bottom have been so strained as to curve or arch upward. This is the opposite of sagging, which, applied in a similar manner, means, in consequence of an opposite kind of strain, to curve downward.

Hold.— That part of the ship which is below the lower deck between the bulkheads, and which is reserved for the stowage of ballast, water, and pro-

visions in ships of war, and for cargo in merchant vessels.

Hooding Ends.— Those ends of the plank which bury in the rabbets of the stem and sternposts.

Hook and Butt.— A mode of fastening timbers together endways by scarphing or laying the ends over each other.

Horse-Iron.— An iron fixed in a handle and used with a beetle by calkers to horse up or harden in the oakum.

Horseshoes.— Large straps of iron or copper shaped like a horseshoe and let into the stem and gripe on opposite sides, through which they are bolted together to secure the gripe of the stem.

Hull.— The whole frame or body of a ship exclusive of the masts, yards, sails, and rigging.

I

In-And-Out.— A term sometimes used for the scantling of the timbers of the molding way, but more particularly applied to those bolts in the knees, riders, etc., which are driven through the ship's sides or athwartships, and therefore called in-and-out bolts.

Inner Post.— A piece of oak timber brought on and fayed to the fore side of the main sternpost, for the purpose of seating the transoms upon it. It affords greater security to the ends of the plank, as the main post is seldom sufficiently afore the rabbet for that purpose, and gives greater strength to that part of the ship.

K

Keel.— The main and lower timber of a ship, extending longitudinally from the stem to the sternpost. It is formed of several pieces, which are scarphed together endways, and form the basis of the whole structure. It is generally the first thing laid down upon the block in the construction of a ship.

Keelson or Kelson.— The timber formed of long square pieces of oak, fixed within the ship exactly over the keel, and which may, therefore, be considered as the counterpart of the latter, for binding and strengthening the lower part of the ship; for which purpose it is fitted to and laid upon the middle of the floor timbers and bolted through the floors and keel.

Knees.— The crooked pieces of oak timber by which the ends of the beams are secured to the sides

of the ship. Of these such as are fayed vertically to the sides are called hanging knees, and such as are fixed parallel to, or with the hang of, the deck, are called lodging knees.

Knee of the Head.— The large flat timber fayed edgeways upon the fore part of the stem. It is formed of an assemblage of pieces of oak coaked or tabled together edgeways, on account of its breadth, and it projects the length of the head. Its fore part should form a handsome serpentine line or inflexed curve. The principal pieces are called the main-piece and lacing.

Knight Heads or Bollard Timbers.— The timbers next the stem on each side and continued high enough to form a support for the bowsprit.

Knuckle.— An acute angle on some of the timbers of a ship.

L

Laborsome.— Subject to or likely to labor or to pitch and roll violently in a heavy sea, by which the masts and even the hull may be endangered. For by a series of heavy rolls the rigging becomes loosened, and the masts may strain upon the shrouds with such force that they may be unable to resist. Also the

continual agitation of the vessel is likely to loosen her joints and make her extremely leaky.

Lacing.— A piece of compass or knee timber which is fayed to the back of the figure-head and the knee of the head and bolted to each.

Lap Over or Upon.— The mast carlings are said to lap upon the beams on account of their great depth, and the head-ledges at the ends lap over the coamings.

Lateral Resistance.— The resistance of the water against the sides of a vessel in a direction perpendicular to her length.

Launching Planks.— A set of planks, generally used to form the platform on each side of the ship, on which the bilge ways slide for the purpose of launching.

Laying Off or Laying Down.— The act of delineating the various parts of the ship to its true size upon the mold loft floor, from the draft given for the purpose of making molds, is performed as follows: The vessel is represented as being cut in sections, usually in three ways: First, crossways; second, on level or parallel lines with the water line; third, by vertical section or parallel lines with that through the keel, stem, or sternpost. These sections are: First,

the body plan, which forms the most prominent part and represents the vessel as being cut crossways of the keel; second, the breadth plan, which represents the vessel as being cut by lines parallel with the water line; third, the sheer plan, or a longitudinal view supposing the vessel to be divided or cut right through the center, and looking at one of the halves, where divided. These three plans combined are what is generally known as the draught of a ship. Without due attention and accuracy in laying down, it is almost impossible to obtain a good form of vessel and insure fairness; nor could the architect without them give any statement of the probabilities of the behavior, or speed, or estimate accurately the weight of the structure, carrying capacity, or cost.

To commence to lay a vessel down, the first thing necessary is a level (or nearly level) floor. It need not be so long that the vessel may be represented on it at full length, but must be wide enough to take the full width and depth of the vessel. Some of the government navy yards have lofts of sufficient size for the full length of the largest vessels, but in general practice this is not the case.

Next, a measure batten or pole is to be made, and this pole is to be the standard for all measurements both in this work and in the building yard. It is very important to establish this at the very outset.

Now make a long batten or pole about two and one-half inches wide by three-fourths of an inch in thickness, that will extend the entire length of the

floor, to be used for sheer lines or those not requiring much curve, and known as the sheer batten. Also one about one and one-fourth inches wide by three-fourths of an inch thick, suitable for being used on greater curves and known as the water line batten. Also one about three-fourths of an inch wide by one-half an inch thick and known as the body plan batten.

It will be found convenient to have at hand several smaller battens with the size reduced and the ends tapered for use on special curves. A number of large awls are also required for holding the battens in place; some loft men, however, prefer nails sharpened to a point for this use. Procure also chalk of two or more colors and wide pencils.

Having decided upon a satisfactory plan or model, to transfer the same to the floor you will begin by first taking the measurements from the plan or model by a scale in the same manner they are to be placed. In doing so it is customary to make "a table of ordinates." Much labor will be saved in the loft room by using great accuracy and care in reading the scale and compiling the table, as well as in the setting off in the loft. The table is usually made to read feet, inches, and eights of an inch.

If a measurement is a trifle more than one-eighth of an inch the sign plus (+) is added, and if less than one-eighth of an inch the sign minus (–) is added; thus 12, 3, 7+ would be read twelve feet, three inches, and seven-eighths of an inch full.

Now strike or mark on the floor a straight line on the body plan. This is called the base line. Next erect a line at right angles to the base. This line will be the center line of the vessel. Make parallel lines with the base line four to six feet apart. These are termed water lines. Now set off parallel lines on each side of the center line. They are usually dotted on the body plan. Also put a line each side of the center for the breadth of the ship, and then set off lines that represent the rise of the floor.

Next, strike a level line which will represent the center of the ship and run parallel lines at two feet, four feet, and six feet apart. Of course we assume in this case only three sections with lines two feet apart, but number and spacing may be lessened or increased to suit the size of the vessel. At the base line on the plan set off a frame section, at right angles to the base line. They generally represent every sixth frame, but can be varied according to the shape of the ship. The first and last are called the after and forward perpendiculars. In the sheer plan draw lines parallel to base, two, four, and six feet apart, they are termed water lines, the same as on the body plan. Next set off frame sections and vertical lines, at right angles to the base, space and number similar to those on the half-breadth plan. When this is finished, all the fixed lines are established on the floor. It is customary in laying off the sheer and half-breadth plans to make the base line serve for both.

Where the mold loft is rather short to admit of a vessel being laid down full length, the vessel may be contracted, that is, frame sections are placed half the proper distance apart. In vessels with very fine lines it is advisable to contract the lengths, especially at the ends, as it causes the lines to show more of a fullness or curve, and consequently the battens will give a quicker curve, and detect errors in setting off any uneven places in the lines.

From the table of ordinates mark sheer spots on all the section lines on the sheer plan, and with long batten draw the sheer line fore and aft, using a piece of chalk. From the table of ordinates mark points for the stem at each water line, and measuring forward from one of the frame sections, place a batten on the points obtained and draw in curve for the shape of the stem; also from the table mark off stern points at certain level lines parallel with water line and draw in curve by the aid of a batten. From the table, set off on the body plan a half-breadth at two feet water line, also half-breadths at four and six feet water lines, and half-breadth and height of rail for midships from section four. Nail or pin a batten down to the points already obtained and see that the curve is fair, then draw it with chalk or pencil. Next take frame section five, mark half-breadths at the various water lines and rail and draw a line through the points with batten as before.

Proceed and line in all the other frame sections

on the body plan in a similar way as four. If batten does not pass exactly through the spots do not force it back to the spots, but see that the curve is fair, the height of the foot of the seventh section to be taken from the seventh section line on the sheer plan. Again take the half-breadth of six feet water line at the various frame sections on the body plan and transfer them onto the half-breadth plan in this manner; lay batten on frame section four and mark off water line points, then transfer batten onto fifth frame section line and mark off water line points, and so on until you have points on each frame section transferred to half-breadth plan. Pin batten down to pass through points and mark in water lines. Transfer all other water-line points from the body to the half-breadth plan in like manner, and run in lines; also the width of deck lines is to be treated similar to water lines. The taking of water lines on the half-breadth plan are transferred from plan where each water line intersects stem and stern lines.

Now fair and prove the water lines by vertical longitudinal sections, already marked by dotted lines on the body and half-breadth plans. Transfer heights from the base line of the body plan, where the transverse sections intersect line on the same frame station. Points may also be transferred from the half-breadth plan to the sheer plan for the development of the vertical longitudinal section. When water lines on the half-breadth plan intersect

vertical longitudinal section lines, these points would be squared up to the sheer plan; and where they intersect the corresponding water lines, a batten should be fastened down and a line run in. Any change of the lines in one plan makes a corresponding change in the other plans. It is customary to test correctness of form by running diagonal lines on the body plan. The process of fairing the ship by diagonal lines instead of water lines is much the same. Take off sets from the diagonal in the same way as with water lines on the body plan and transfer them onto the half-breadth plan. The difference in running these lines, from the water lines, is principally in establishing the point from which measurements are to be taken. Where the batten does not pass through points marked, the new distance should be transferred back to the plan from which it was taken, and a new line drawn, so that all points when transferred from one plan to another will agree. After having proved that all water lines, frame section lines, and diagonals meet their corresponding marks in the several places, the vessel has been faired. Up to this point we have only obtained the form of the vessel and the shape of certain frames. The intermediate frame lines can now be run in on the half-breadth and sheer plans, stern, cants, longitudinals, keelsons, ribbands, and floors.

Deck lines and edges of outside planking require to be marked off on the various plans and faired, and the method to be pursued is similar to that

already described. Some draughtsmen use a shorter or contracted method for fairing. Thus, a few frames evenly spaced are put in the body plan on the floor from model or table at once. They then take a board about eight inches wide by three feet long, and with square marks across the same about one-half inch apart, each mark representing a frame section. On this set off from the edge of the board, the edge being used as the first water line (not as a center line); the first line run will represent the second water line, or, in other words, the difference in the increase in the width of the water line. This is continued up to the widest water line.

Beveling of frames is a term often used, and means the amount of angle which must be put on the outside of frames in order that the same, if extended, would meet the adjacent frame. These angles are taken from the floor and placed on small boards known as "bevel boards."

There are many other lines employed in the mold-loft work not referred to herein, such as buttock lines, bow lines, dead-wood lines, bearing or stepping lines, rabbet lines, ribband lines, etc., but they are used for special purposes, and have reference to some local portion of the structure of the vessel, such as the shaping of the knight heads, counter frames, hawse pieces, cant frames, etc.

The above is the method which was used by C. H. Simonds. Below is given the system of laying off which has been practiced in the past in the

yards of C. S. Swan & Hunter, and which were said to have been a decided success. The use of paper, on account of its shrinkage, having caused some discrepancies, and the use of wood tables not proving entirely satisfactory, it was decided to use white marble with cast glass and opal.

The principal table for laying off on a one-inch scale is composed of white marble slabs, fitted in lengths of about six feet, carefully jointed, with a total length of thirty feet. On this table the sheer and the half-breadth plans are drawn. The other two tables — one of cast glass and one of opal — are used for the fore and after bodies respectively. It may be mentioned that the draughtsman in charge of the work preferred the white marble to either of the other tables, as he found that the glossy surface of the cast glass and opal were against quick work with a drawing pen, and in cold weather the moisture from the hands condensed more rapidly on these than on the marble.

The laying off is done to a scale of one inch to the foot. The system adopted is briefly as follows: The level lines and frames having been marked off on the sheer slab, the sheer and half-breadth of the rail are faired by contraction and drawn in. They are then transferred to the section slab, thus giving the correct sheer and half-breadth at the top of each frame station. The water lines are now roughed in on the half-breadth and the buttocks faired to them in the sheer. Then the buttock and water

line spots are transferred onto the section table and the cross sections drawn in. Corrections are here made until the buttock, water line, and section spots all agree in absolute fairness. When this stage has been arrived at, diagonals are drawn in on the body section table in convenient positions, as square to the frame as practicable. These diagonals are then lifted off and run on the sheer slab to further fair up the sections. The midship portions of the water lines and buttocks are faired by contraction. The work up to this stage has been done in pencil, but now the correct lines are inked in. The offsets are now lifted off and transferred to the loft book for scriving and future reference. The slabs are easily cleaned with "Monkey Brand," or some similar soap, and are ready for fresh work.

Ledges.—Oak or fir scantling used in framing the decks, which are let into the carlings athwartship. The ledges for gratings are similar, but arch or round up to conform to the head ledges.

Lengthening.—The operation of separating a ship athwartships, and adding a certain portion to her length. It is performed by clearing or driving out all the fastenings in wake of the butts of those planks which may be retained and the others are cut through. The after end is then drawn apart to a limited distance, equal to the additional length proposed. The keel is then made good, the floors

crossed, and a sufficient number of timbers raised to fill the vacancy produced by the separation. The keelson is then so replaced as to break the joints formed by the new scarphs of the keel, and as many beams as may be necessary are placed across the ship in the new interval, and the planks on the outside are placed with a proper shift. The clamps and foot-waling within the ship are then supplied, the beams kneed, and the ship completed in all respects as before.

Length Between Perpendiculars.— In the case of perpendicular stem and sternposts, the length is the level distance between the after side of the sternpost and the fore side of the stem in line of the upper deck. In case of rake stem, or stern or clipper stem, it is the line between the perpendiculars, dropped from the after side of the sternpost and the fore side of the stem.

Length Over All.— The length from the extreme point of the stern to the fore end of the figure-head, or extreme point of the stem.

Let-In.— To fix or fit one timber or plank into another, as the ends of cartlings into the beams, and the beams into the clamps, receptacles being made in each to receive the other.

Level-Lines.— The lines which determine the shape of the ship's body horizontally, or square from the

middle line of the ship. These are made by horizontal planes, coinciding with the water lines, when the ship is on an even keel.

Limber Holes.— Square grooves cut through the under side of the floor timber, about nine inches from the keel on each side, through which water may run toward the pump-well from the entire length of the floors. This precaution is necessary in merchant ships only, where small quantities of water, in consequence of the heeling of the ship, may come through the ceiling and damage the cargo. It is on this account that the lower futtocks of merchant ships are cut off short of the keel.

Limber Passage.— A passage or channel formed throughout the whole length of the floor, on each side of the keelson, to give the water a free course to the pumps. It is formed by the limber strake on each side, a thick strake wrought next to the keelson, from the upper side of which the depth of the hold is always taken. This strake is kept at about eleven inches from the keelson. The upper part of the limber passage is formed by the limber boards, which are made to keep out all dirt and other obstructions. These boards are composed of short pieces of oak plank, one edge of which is fitted by a rabbet into the limber strake, and the other edge beveled with a descent against the keelson. They are fitted in short pieces for the convenience of taking up any

one or more readily, in order to clear away any obstruction in the passage. When the limber boards are fitted, care should be taken to have the butts in those places where the bulkheads come, as there will be no difficulty then in taking up those which come near the bulkheads. A hole is bored in the middle of each butt to admit the end of a crow for prizing it up, when required. To prevent boards from being displaced, each one should be marked with a line corresponding with one on the limber strake.

Lips of Scarphs.— The thick end left on each of the pieces of timber, which are united by a scarph joint. Otherwise they would become sharp and liable to split; and in other cases would not bear calking, as the scarphs of the keel, stem, etc.

Lodging Knees, (see Knees).

Long Timbers.— Timbers in the cant bodies which reach from the dead-wood to the head of the second futtock.

Loof.— That part of a vessel where the planks begin to bend as they approach the stern.

Lopsided.— A term which is used to describe a vessel when she will not swim upright, because her sides are unequal.

M

Main Breadth.— The broadest part of the ship at any particular timber or frame, which is distinguished on the sheer draught by the upper and lower heights of breadth lines.

Main Wales.— The lower wales, which are generally placed on the lower breadth, and so that the main deck knee bolts may come into them.

Manger.— An apartment extending athwart the ship immediately within the hawse holes. It serves to prevent the passage of water, which may come in at the hawse holes, or from the cable when heaving in. The water, thus prevented from running aft, is returned into the sea by the manger scuppers, which are larger than the other scuppers on that account.

Mauls.— Large hammers used for driving tree-nails, having a steel face on one end and a point or pen drawn out at the other. Double-headed mauls have a steel face at each end, of the same size, and are used for driving bolts, etc.

Measurement.— The rule by which the length, etc., of a vessel is determined.

Meta-Center.— That point in a ship above which the center of gravity must by no means be placed;

because if it were, the vessel would be likely to overset. The meta-center, which has also been called the shifting center, depends upon the location of the center of gravity, for it is the point where a vertical line drawn from the center of cavity cuts a line passing through the center of gravity, and perpendicular to the keel.

Middle Line.— A line dividing the ship exactly in the middle. In the horizontal, or half-breadth plan, it is a right line bisecting the ship from the stem to the sternpost. In the plane of projection, or body plan, it is a perpendicular line bisecting the ship from the keel to the height of the top of the side.

Midship Section.— The fullest part of the ship, and is generally placed midway between the perpendiculars. In some cases it is nearer the stern than the stem. It is supposed to be at the lowest point of the sheer.

Molded.— Cut to mold. Also the size or largeness of dimension of the timbers that way the mold is laid.

Molded Beam.— The greatest width of the ship from heel of frame to heel of frame on the midship section.

Molded Depth.— The vertical distance from the top of the keel, square out to the side, and the under

side of the upper deck stringer plate at the lowest point of the sheer.

Molds.— Pieces of deal or board made to the shape of the lines of a mold-loft floor, as the timber, harpins, ribbands, etc., for the purpose of using them as patterns to cut out the different pieces of timber, etc., for the ship. Also the thin, flexible pieces of pear tree, or box, used in constructing the draught and plans of ships, which are made in various shapes, viz., to the segments of circles of from one foot to twenty-two feet radius, increasing six inches on each edge; and numerous elliptical curves, with other figures.

Momenta.— The plural of momentum.

Momentum.— The momentum of a heavy body, or of an extent considered as a heavy body, is the product of its weight multiplied by the distance of its center of gravity from a certain point, assumed at pleasure, which is called the center of momentum, or from a line which is called the axis of the momentum; or, more briefly stated, it is the product of the mass by the velocity, and may be determined by a simple geometric formula.

Mortise.— A hole or hollow made of a certain size and depth in a piece of timber, etc., in order to receive the end of another piece with a tenon, which exactly fits the mortise..

Munions.— The pieces that are placed vertically to divide the panels in framed bulkheads; also between the lights in a ship's stern and quarter-galleries.

N

Nails.— Iron pins of various kinds which are used to fasten the boards, planks, and iron work of a ship. The different kinds, named according to the purpose for which they are used, are as follows: Deck nails, or spike nails, which are from four inches and a half to twelve inches long, and have snug heads, and are used for fastening planks and the flat of the deck. Weight nails are similar to deck nails, but not so fine, have square heads, and are used for fastening cleats, etc. Ribband nails are similar to weight nails with this difference, they have large round heads, so as to be easily drawn; they are used for fastening the ribbands, etc. Clamp nails are short, stout nails, with large heads for fastening iron clamps. Port nails, double and single, are similar to clamp nails, and are used for fastening iron work. Rider nails are also similar, but are used chiefly for fastening the pintles and braces. Filling nails (now obsolete)were generally of cast iron, and driven very thickly into the bottom planks instead of copper sheathing. Sheathing nails (obsolete) were used to fasten wood sheathing on the ship's bottom to preserve the plank, and

prevent the filling nails from tearing it too much. Nails of other kinds are four, six, eight, ten, twenty-four, thirty, and forty penny nails, of different lengths, and used for nailing board, etc. Scupper nails are short nails with very broad heads, used to nail the flaps to the scuppers. Lead nails are small round-headed nails for the nailing of lead. Flat nails are small sharp-pointed nails, with flat, thin heads, and are used for nailing the scarphs of molds. Sheathing nails, for nailing copper sheathing, are of metal, cast in molds, and are about one inch and a quarter long. They have flat heads, polished to prevent the adhesion of weeds, and are counter sunk. Boat nails, used by boat builders, are of various lengths, generally rose-headed, square at the points, and made of both copper and iron.

Naval Architect.— A designer of vessels.

O

Oakum.— Old rope, untwisted and loosened like hemp, in order to be used in calking.

Orlop.— A deck on battle ships, which is placed below the berth deck and on which the cables were formerly coiled.

Over-Launch.— To run the butt of one plank to a certain distance beyond the next, but above or below it, in order to make stronger work.

P

Palleting.— A slight platform made above the bottom of the magazine in battle ships, to keep the powder from absorbing moisture.

Palls.— Stout pieces of iron, so placed near a capstan or windlass as to prevent a recoil, which might overpower the men at the bars when heaving.

Paper-Boat Designers.— A name which was once applied in ridicule by block-model designers to naval architects who forsook the jackknife and block of pine for the arithmetic and the drawing board.

Partners.— Those pieces of thin plank, etc., fitted into a rabbet in the mast or capstan carlings for the purpose of wedging the mast and steadying the capstan. Also any plank that is thick, or projects above the rest of the deck, for the purpose of steadying or strengthing whatever passes through the deck, as the pumps, bowsprit, etc.

Pay.— To lay on a coat of tar, etc., with a mop or brush in order to preserve the wood and keep out water. When one or more pieces are scarphed, as the beams, etc., the inside of the scarphs are payed with tar as a preservative, and the seams, after they are calked, are payed with pitch to keep the water from the oakum, etc.

Pink.— A ship with a narrow round stern; hence all vessels, however small, having their sterns fashioned in this manner are said to be pink-sterned.

Pintles.— Straps of mixed metal, or of iron, fastened onto the rudder, in the same manner as the brace on the sternpost, having a stout pin or hook at the ends, with the points downward to enter in and rest on the braces, on which the rudder traverses or turns as upon hinges, from side to side. Sometimes one or two are shorter than the rest, and work in a socket brace, which allows the rudder to turn more easily. The latter are called dumb pintles. Some are bushed.

Pitch.— Tar boiled until it forms a harder and more tenacious substance.

Pitching.— The inclination or vibration of the ship lengthways about her center of gravity, or the motion by which she plunges her head and after part alternately into the hollow of the sea.

Planking.— Covering the outside of the timbers with planks, sometimes called skinning, the plank forming the outer coating when the vessel is not sheathed.

Plank-Sheers or Plank-Sheer.— The pieces of plank laid horizontally over the timber heads for the purpose of covering the top of the side, hence sometimes called covering boards.

Poppets.— Those pieces (generally fixed) which are placed perpendicularly between the ship's bottom and the bilge way at the fore and aftermost parts of the ship to support her when launching.

Point-Veliqua.— That point where, in a direct course, the center of effort of all the sails should be found.

Port.— Ports are square openings in the bulwark, side, bow, or stern of a vessel, and serve various purposes; some of the ports are the ballast-port, the bow-port, and the stern-port.

Profile or Sheer.— The longitudinal elevation with the stem placed to the right-hand side. It shows the sheer of rail, knuckle, and decks, the position of the frame stations or sections, and the level or water lines; the form of the ship at the center line, and at the fixed longitudinal vertical planes, parallel to the center, called bow and buttock lines.

Pump.— The machine fitted in the walls of ships to draw water out of the hold.

Pump Cisterns.— Cisterns fixed over the heads of pumps to receive the water until it is conveyed through the sides of the ship by the pump-dales.

Pump-Dales.— Pipes fitted to the cisterns to convey the water from them through the ship's sides.

Q

Quarter-Galleries.— The projections from the quarters abaft, fitted with sashes and balluster, and intended both for convenience and ornament to the aft part of the ship.

Quicken.— To give anything a greater curve. For instance, to "quicken the sheer" is to shorten the radius by which the curve is struck. This term, therefore, means the opposite of "straightening the sheer."

Quick Work.— That part of a vessel which is above the chain wales and decks, so called in shipbuilding on account of its rapidity of construction. The term is also applied to that part of the vessel that is under water when she is laden.

R

Rabbet.— A joint made by a grove, or channel, in a piece of timber, cut for the purpose of receiving and securing the edge or ends of the planks; as the planks of the bottom into the keel, stem, or sternpost, or the edge of one plank into another.

Rag-Bolt.— A kind of bolt having its point jagged or barbed to make it hold more securely.

Rake.— The overhang of the stem or stern beyond a perpendicular with the keel, or any part or thing that forms an obtuse angle with the horizon.

Ram-Line.— A small rope or line sometimes used to strike the center line of a vessel, or to run its sheer lines or hang of the decks, for setting the beams fair, etc.

Rasing.— The act of marking, by a mold, on a piece of timber, or any marks made with a tool called a rasing knife.

Reconcile.— To make one piece of work answer fair with the molding or shape of the adjoining piece; and more particularly in the reversion of curves.

Reeming.— A term used by calkers, meaning the act of opening the seams of the planks, that the oakum may be more readily admitted.

Reeming-Irons.— The large irons used by calkers in opening the seams.

Rends.— Large open splits or shakes in timbers, particularly in plank, caused by exposure to the wind or sun.

Ribbands.— The longitudinal pieces of fir, about five inches square, nailed to the timbers of the

square body (those of the same description in the cant body being shaped by a mold called harpins) to keep the body of the ship together, and in its proper shape, until the planking is attached. The shores are placed beneath them. They are removed entirely when the planking is fastened on. The difference between the cant ribbands and the square or horizontal ribbands is, that the latter are only ideal and used in laying off.

Ribband Lines.— The same as diagonal lines.

Riders.— Interior timbers occasionally placed opposite to the principal ones, to which they are bolted, and extending from the keelson to the beams of the lower deck.

Rise of Bottom.— Produce the line of the midship bottom to the half-breadth perpendicular, then the distance between this point and the base line, squared from the top of the keel, is the rise of the bottom. It is in most places straight, but in war vessels or yachts it may be round or hollow.

Rising.— A term derived from the shape of the ship's bottom in general, which gradually narrows or becomes sharper toward the stem and the sternpost. It is on this account that the floor toward the extremities of the ship is raised or lifted above the keel; otherwise the ship would be so very acute

as not to be provided with timber of sufficient strength in the middle, or cutting down. The floor timbers forward and abaft are with regard to their general form and arrangement, therefore gradually lifted or raised upon a solid body of wood called the dead- or rising-wood, which of course must have more or less rising as the body of the ship assumes more or less fulness or capacity.

Rising Floors.— The floors forward and abaft, which, on account of the rising of the body, are the most difficult to construct, as they must be deeper in the thwart, or at the cutting down, to preserve the strength.

Rising Line.— An elliptical line drawn on the plan of elevation to determine the sweep of the floor-heads throughout the ship's length, which accordingly determines the shape of the bottom with regard to its being full or sharp.

Rising of Boats.— A narrow strake of board which is fastened inside to support the thwarts.

Rolling.— That motion by which a ship vibrates from side to side. Rolling is, therefore, a kind of revolution about an imaginary axis passing through the center of gravity of the ship, so the nearer the center of gravity is to the keel the more violent will be the roll.

Room and Space.— The distance from the molding edge of one timber to the molding edge of the next timber, which is always equal to the breadth of the two timbers and two or four inches more. The room and space of all ships, that have ports, should be so disposed that the scantling of the timber on each side of the lower ports and the size of the ports, fore-and-aft, may be equal to the distance of two rooms and spaces.

Rough Tree-Rails.— In men-of-war they are the broad plank running fore-and-aft covering the heads of the top timbers, thus forming the bottom of the hammock netting. In merchant vessels the rails along the waist and quarters, nearly breast-high, to prevent persons falling overboard, are called rough tree-rails. This term originated from the practice in merchant vessels of carrying their rough or spare gear in crutch irons along the waist.

Round-Ribbed.— A vessel carrying very little run and flat-bottomed.

Rudder Chocks.— Large pieces of fir, to fay or fill up the excavation on the side of the rudder in the rudderhole, so that the helm being in midship, the rudder may, if desired, be fixed in that position.

Rudder Trunk.— This trunk is a casing made of wood or steel plate about the hole in a ship's stern,

through which the rudderhead passes, and should be sufficiently large to allow the rudder to go into position easily, without disturbing the structure.

Rudder.— A broad flat device of varying form, hinged vertically to or abaft the sternpost of a vessel, or at the stern of a boat, and serving to change the course of the vessel when it is swung to either side. In large vessels it is operated with a pair of chains or cables, a wheel, and their mechanism.

Run.— The narrowing of the ship abaft, as of the floor toward the sternpost, where it becomes no broader than the post itself. This term is also used when speaking of the running or drawing of a line on the ship, or mold-loft floor, as " to run the wale line," or deck line, etc.

Rung Heads.— The upper ends of the floor timbers.

S

Sail Plan.— The side elevation of a vessel, showing the sails as they will appear when they are bent and stretched.

Scantling.— The dimensions given for the timbers, planks, etc. Likewise all quartering under five inches square, which is called scantling; all above that size is called carling.

Scarph or Scarf.— A lapped joint made by beveling off, notching, or otherwise cutting away the sides of two timbers at the ends, and bolting or strapping them together so as to form one continuous piece, usually without increase of thickness.

Scarphing.— The letting of one piece of timber or plank into another with a lap, in such a manner that both may appear as one solid and even surface, as keel-pieces, stem-pieces, etc.

Scrieve Board.— A platform formed of well-seasoned deals, laid edge to edge, fastened securely together, and placed in a position near the frame furnace or frame-bending slabs. It is planed on the topside and coated with a mixture of lampblack and liquid turpentine. When dry the body plan is copied upon it, and the lines cut in with a scrieve knife. Sometimes both sides of the ship are scrieved in with the base line of each body on opposite edges, so that the frames lap onto each other; but to prevent confusion it is better to place each full body on separate boards, or only to scrieve in half the ship.

Scuppers.— Lead pipes let through the ship's sides to convey the water from the decks.

Seams.— The openings between the edges of the planks when wrought.

Seasoning.— A term applied to a ship kept standing a certain length of time after she is completely formed and dubbed out for planking, which should never be less than six months when circumstances will permit. Seasoned plank or timber is such as has been cut down and sawn out one season at least, particularly when thoroughly dry and not liable to shrink.

Seating.— That part of the floor which fays on the dead-wood, and of a transom which lays against the post.

Sending or Scending.— The act of pitching violently into the hollow or intervals of the waves.

Setting or Setting To.— The act of making the plank, etc., fay close to the timbers by driving wedges between the plank, etc., and a wrain staff. Hence we say, "set, or set away," meaning to exert more strength. The power or engine used for the purpose of setting is called a sett, and is composed of two ring-bolts and a wrain staff, cleats, and lashings.

Shaken or Shaky.— A natural defect in plank or timber when it is full of splits or clefts and will not bear fastenings or calking.

Sheathing.— A thin kind of doubling, or casing, or fir board or sheet copper, and sometimes of both,

over the ship's bottom to protect the plank from worms, etc. Tar and hair, or brown paper dipped in tar and oil, is laid between the sheathing and the bottom.

Sheer.— The longitudinal curve or hanging of a ship's side in a fore-and-aft direction.

Sheer Draught.— The plan of elevation of a ship on which is described the outboard work, as the wales, sheer rails, ports, drifts, heads, quarters, post, stem the hang of each deck inside the height of the water line, etc.

Sheer Plan.— A ship construction drawing which shows the side elevation, rail-plank sheer, outlines of stem, stern, keel, and overhang. The water lines appear in this plan as straight lines, as do also the frame lines.

Sheer Line.— An approximate mean sheer in inches may be found by dividing the length in feet between the perpendiculars by ten and adding ten. The sheer aft is usually made one-third of the total, which leaves two-thirds for the forward. The lowest point of the sheer may or may not be on the midship frame.

Sheer Strake.— The strake or strakes wrought in the topside, of which the upper edge is wrought well

with the top timber line, or top of the side, and the lower edge kept well with the upper part of the upper deck ports in midships, so as to be continued whole all the way fore-and-aft and not cut by the ports. It forms the chief strength of the upper part of the topside, and is therefore always worked thicker than the other strakes, and scarphed with hook and butt between the drifts.

Shell Flange.— The outward turn of the shell of a steel block, such as are used for cargo blocks, and attached to cargo or swinging booms.

Ships.— The development of the shipbuilder's art dates from a very early time. There is thought to be very little question that the Phoenicians were the leaders in this development. However, representations of Egyptian ships have been found which were not later than 3000 years B. C. Some of these were large vessels with as many as twenty-six oars on a side and carrying two masts. The shipwrights of Corinth and Syracuse gained considerable renown among the Ancients, while the Romans after the first Punic War rapidly developed a navy of their own construction. Some of their great corn ships, which were used to carry grain from Egypt, are said to have been as much as one hundred and twenty cubits long by thirty cubits broad and twenty-nine cubits in depth. About the time of Charlemagne the Vikings appeared along the western coast of Europe, and

with them came another departure in the development of sea-going vessels.

The period of the Crusades was one of great activity in shipbuilding, in which the Venetians and Genoese were the leaders. The Saracens also are said to have had some great vessels. There is a story of the destruction of a ship by Richard Coeur de Lion, which had three masts and on board of which were fifteen hundred men.

In England during the time of Henry the Fifth many large vessels were built and called "great ships, cogs, carracks, ships, barges, and balingers." During the time of the Tudors there was still greater advance made in shipbuilding. Pictures of ships are shown which carried several tiers of guns, four and even five masts, and with enormous structures in the way of forecastles and deck houses aft.

During the seventeenth century, as a result of the expansion of trade under the East India Company and otherwise, there was considerable improvement in shipbuilding. The Dutch and French had taken their places on the seas and were engaged in building ships. Some of the French ships are said to have been larger and of greater speed than the English ships.

The introduction of steam as a motive power wrought inevitable changes in the shipbuilding industry, and led to the introduction of iron and steel to a greater extent than had been attempted before in the construction of ships.

So far as the distribution of sails is concerned, the sailing ships of today differ little from those of the middle of the nineteenth century, and in the case of many types little from those of a much earlier period. The change from wood to iron and steel has resulted, of course, in some changes in the rigging to suit the longer and larger vessels; and steel masts, with wire rope, standing rigging, and various other labor-saving devices, have been introduced. The larger ships carry steam winches, steam windlasses, and steam steering gear, but the general appearance of the vessels has not changed very greatly.

Mention is made of schooners which carry as many as seven or eight masts, the largest sailing vessel afloat in 1910 was said to be the five-masted barque *R. C. Rickmers*, which was four hundred and forty-one feet long over all, with a fifty-three foot eight inch beam.

Sailing ships with auxiliary power are those which are provided with auxiliary steam or other propelling machinery, by the use of which towage costs are saved and better headway made. It is expected that the introduction of heavy oil engines will enable the vessels so equipped to compete successfully with tramp steamers in certain trades.

The greatest period of development in American shipbuilding was from 1812 to 1850, and the yards were full of busy men until about 1861. Forty years of war had led the Americans to design ships for

speed and handiness, and the builders carefully studied the models and rigs to attain these qualities. Such study and experiment placed the American builders ahead of others, and their models were copied the world over by shipbuilders. As a result of that study, by 1850 the American sailing vessel had reached perfection and little advance has been made since then.

Siding or Sided.— The sides or dimensions of timber the contrary way to molding or molded side.

Sirmarks.— The different places marked upon the mold where the respective bevelings are required, as the lower sirmark, floor sirmark, etc.

Sister Keelson.— Long pieces of timber connected endways by scarphs, placed on each side of the main keelson, and extending as far forward and aft as practicable, for the purpose of giving additional strength at the middle line of a vessel. They are fastened by through-bolts horizontally to the middle-line keelson and vertically to the floors.

Slabs.— Pieces of wood fitted between the whelps.

Sleepers.— The knees that connect the transoms to the after timbers of the ship's quarters.

Sliding Planks.— The planks upon which the bilge ways slide in launching.

Slip.— The foundation laid for the purpose of building the ship upon, and launching her.

Snap.— To hance or bevel the end of anything so as to fay upon an inclined plane.

Snying.— A term applied to plank when their edges round or curve upward. The great sny occasioned in full bows or buttocks is only to be prevented by introducing steelers.

Spalling.— A spale or spall is a temporary brace, and spalling is to fasten or brace with spales.

Spansion.— The spaces forward and abaft the paddle boxes on steamboats. The spansion beam is that beam which projects from the steamboat's sides and forms the shape of the paddle boxes. Spansion rim, is the wale in the steamboat's side upon which the paddle beam rests and is supported. This applies of course only to a certain type of vessel.

Specific Gravity.— The comparative difference in the weight or gravity of two bodies of equal bulk, hence also called relative or comparative gravity, because we judge of it by comparing one body with another. Table of Specific Gravities:

Lead	11.325
Fine copper	9.000
Gun metal	8.784
Fine brass	8.350

Iron	from 7.827 to 7.645
Cast iron	7.425
Sand	1.520
Lignum vitæ	.327
Ebony	1.177
Pitch	1.150
Rosin	1.100
Mahogany	1.063
Boxwood	1.030
Sea water	1.030
Tar	1.015
River water	1.009
Rain water	1.000
Oak	.935
Ash	.800
Beech	.700
Elm	.600
Fir	.548
Cork	.240
Common air	4.232

Spirketing.— A thick strake or strakes, wrought inside upon the ends of the beams or waterways. In ships that have ports the spirketing reaches from the waterways to the upper side of the lower sill, which is generally of two strakes wrought anchor-stock fashion; in this case the planks should always be such as will work as broad as possible. They should be about six inches broad to admit the bolts.

Spurs.— Pieces of timber fixed on the bilge ways, their upper ends being bolted to the vessel's sides above the water. Also curved pieces of timber serving as half beams to support the decks where the whole beams cannot be placed.

Spur Shoes.— Large pieces of timber that come abaft the pump-well.

Square Body.— The figure which comprehends all the timbers whose areas or planes are perpendicular to the keel; which is all that portion of a ship between the cant bodies.

Square Timber.— The timbers which stand square with or perpendicular to the keel.

Square Tuck.— A name given to the after part of a ship's bottom when terminated in the same direction, up and down, as the wing transom, and the plank of the bottom end in a rabbet at the foreside of the fashion piece; whereas ships with a buttock are round or circular, and the planks of the bottom end upon the wing transom.

Stability.— That quality which enables a ship to keep herself steady in the water, without rolling or pitching. Stability, in the construction of a ship, is only to be secured by fixing the center of gravity at a certain distance below the meta-center, because the stability of the vessel increases with the altitude of the meta-center above the center of gravity. But when the meta-center coincides with the center of gravity, the vessel has no tendency whatever to remove out of the position into which it may be put. Thus, if the vessel be inclined either to the

starboard or larboard side, it will remain in that position till a new force is exerted upon it; in this case, therefore, the vessel would not be able to carry sail, and consequently would be unfit for the purpose of navigation. If the meta-center falls below the common center of gravity, the vessel will immediately overset.

Stanchions.— Upright parts of wood or iron placed so as to support the beams of a vessel; also upright pieces of timber placed at intervals along the sides of the vessel to support the bulwarks and rail, and reaching down to the bends, by the side of the timbers, to which they are bolted. Also any thick upright support.

Standard.— An inverted knee placed above the deck instead of beneath it, as a bitt standard, etc.

Steeler or Stealer.— A name given to the foremost or aftermost plank in a strake, which drops short of the stem and sternpost, and of which the end or butt nearest the rabbet is worked very narrow and well forward or aft. Their use is to take out the snying occasioned by a full bow or sudden circular buttock.

Stem.— The main timber at the fore part of the ship, formed by the combination of several pieces into a circular shape, and erected vertically to re-

ceive the ends of the bow planks, which are united to it by means of a rabbet. Its lower end scarphs or boxes into the keel, through which the rabbet is also carried, and the bottom united in the same manner.

Stemson.— A piece of compass timber, wrought on the aft part of the apron inside, the lower end of which scarphs into the keelson. Its upper end is continued as high as the middle or upper deck, and its use is to support the scarphs of the apron, as that does those of the stem.

Steps of the Masts.— The steps into which the heels of the masts are fixed are large pieces of timber. Those for the main and fore masts are fixed across the keelson, and that for the mizzenmast upon the lower deck beams. The holes or mortises into which the masts step should have sufficient wood on each side to accord in strength with the tenon left on the heel of the mast, and the hole should be cut rather less than the tenon to allow for shrinkage.

Steps for the Ship's Side.— The pieces of quartering, with molding nailed to the sides amidships about nine inches apart, from the wale upward, for the convenience of persons getting on board.

Stern Frame.— The strong frame of timbers, composed of the sternpost, transoms, and fashion pieces, which form the basis of the whole stern.

Sternpost.— The principal piece of timber in the stern frame on which the rudder is hung, and to which the transoms are bolted. It therefore terminates the ship below the wing transom, and its lower end is tenoned into the keel.

Steving.— The elevation of the ship's cathead or bowsprit; or the angle which either makes with the horizon, generally called steve.

Stopping Up.— The poppets, timbers, etc., used to fill up the vacancy between the upper side of the bilge ways and the ship's bottom, for supporting her when launching.

Stopwater.— A treenail through the stern and keel at their joining, also through the joining of the sternpost and keel.

Straight of Breadth.— The space before and abaft the dead-flat, in which the ship is the same uniform breadth, or of the same breadth as at X or dead-flat.

Strake.— One breadth of plank wrought from one end of the ship to the other, either within or without board.

Stringers.— A strake of plank around the inside of a vessel close to the under side of the beams.

Supporters.— The knee timbers under the catheads.

Syphering.— Lapping the edges of planks over each other for a bulkhead.

T

Tabling.— Letting one piece of timber into another by alternate scores of projections from the middle, so that it cannot be drawn asunder either lengthways or sideways.

Taffarel or Taffrail.— The upper part of the ship's stern, usually ornamented with carved work or molding, the ends of which unite to quarter pieces.

Tasting of Plank or Timber.— Chipping it with an adz or boring it with a small augur for the purpose of ascertaining its quality or defects.

Teach.— A term applied to the direction that any line, etc., seems to point out. Thus we say, "Let the line or mold teach fair to such a spot, raise," etc.

Tenon.— The square part at the end of one piece of timber cut down so as to fix in a hole, called the mortise, which has been made in another piece for joining or fastening the two pieces together.

Thick Stuff.— A name for sided timber exceeding four inches, but which is not more than twelve inches in thickness.

Throat.— The inside of knee timbers at the middle or turn of the arms; also the midship part of the floor timbers.

Timber.— The term used for all pieces of wood of any importance employed in the construction of a ship, but in particular for those forming the frame.

Toe Link.— The bottom link of a chain where it is fastened.

Top and Butt.— An economical method of working or laying long tapering oak ship-plank so as to make good conversion. As the plank runs very narrow at the top, this is done by disposing the top end of every plank within six feet of the butt end of the plank above or below it, letting every plank work as broad as it will hold clear of sap. By this method only can every other seam produce a fair edge.

Topgallant and Forecastle.— The small deck built level with the rail at the forward part of the ship.

Topside.— A name given to all that part of a ship's side above the main wales.

Top Timbers.— The timbers which form the topside. The first general tier of timbers which reach the top are called the long top timbers, and those below are called the short top timbers.

Top-Timber Line.— The curve limiting the height of the sheer at the given breadth of the top timbers.

Touch.— The broadest part of a plank worked top and butt, which place is six feet from the butt end; or the middle of a plank worked anchor-stock fashion. Also the sudden angles of the stern timbers at the counter, etc.

Trail Boards.— A term for the carved work, between cheeks, at the heel of the figure.

Transoms.— The thwartship timbers which are bolted to the sternpost in order to form the buttocks; and of which the curves, forming the round aft, are represented on the horizontal or half-breadth plan of the ship.

Transverse Line.— A right or curved line which cuts a system of other right or curved lines.

Tread of the Keel.— The whole length of the keel in a straight line.

Treenails.—Cylindrical oak pins, which are driven through the planks and timbers of a vessel to fasten or connect them together. These certainly make the best fastening when driven quite through and calked or wedged inside. They should be made of the very best oak, cut near the butt, and perfectly dry or well seasoned.

Tuck.— The aft part of the ship, where the ends of the planks of the bottom are terminated by the tuck-rail, and all that part of a ship below the wing transom when it partakes of the figure of the wing transom as far as the fashion pieces.

Tuck-Rail.— The rail which is wrought well with the upper side of the wing transom and forms a rabbet making provision for calking the butt ends of the planks of the bottom.

Turn of Bilge.— The curved part joining the ship's side with the flat of the bottom.

Turn of Floors.— Sometimes ships are built without double bottoms, then the inner edges of the floors are curved up the bilges.

Turtle Back.— The iron covering which decks over the extreme after part of the upper deck of many steamers. The turtle back commences at the bulwark rail, and it is from its falling home, or rounding at that point, that it derives its name.

W

Wales (Bends).— The totality of the thick outside planking of a vessel, which is fitted about midway between the plank sheer and the light water line. The breadth of the wales is generally equal to

one-fourth or one-third of the vessel's depth, and the thickness from three to nine inches, according to the size of the vessel.

Wall-Sided.— A term applied to the topsides of the ship, when the main breadth is continued very low down and very high up, so that the topsides appear straight and upright like a wall.

Washboard.— A shifting strake along the topside of a small vessel, used occasionally to keep out the sea.

Water Lines or Lines of Flotation.— Those horizontal lines supposed to be described by the surface of the water on the bottom of the ship, and which are indicated at certain depths upon the sheer draught. Of these the most particular are those denominated the light water line and the load water line; the former, namely the light water line, is that line which shows the depression of the ship's body in the water when light or unladen, as when first launched; and the latter, the line which shows the same when laden with her guns and ballast or cargo. In the half-breadth plan these lines are curves, limiting the half-breadth of the ship at the heighth of the corresponding lines in the sheer plan.

Waterways.— The edge of the deck next the timbers, which is wrought thicker than the rest of the

deck, and hollowed out below the level of the deck so as to form a gutter or channel to conduct the water to the scuppers.

Whale Back.— Peculiarly constructed vessels, having the main decks covered in and rounded over, sometimes with upper works; were built originally on the great lakes, and designed for superior stowage capacity. Several of these vessels have made extended ocean voyages.

Whelps.— Pieces of iron which are bolted to wooden windlass barrels so as to prevent the chain cable from cutting the wood.

Whole Molded.— A term applied to the bodies of those ships which are so constructed that one mold made in the midship bend, with the addition of a floor hollow, will mold all the timbers, below the main breadth, in the square body.

Wings.— The places next the side upon the orlop, usually partitioned off in ships of war, that the carpenter and his crew may have access around the ship in time of action to plug up shot-holes, etc.

Wing Transom.— The uppermost transom in the stern frame, upon which the heels of the counter timbers are let in and rest. It is by some called the main transom.

Wood-Lock.— A short piece of wood placed and fastened to a pintle-score (generally the upper one) of a rudder, to prevent the rudder being accidently unshipped; or a piece of elm or oak, closely fitted or sheathed with copper, in the throating or score of the pintle, near the load water line; so that when the rudder is hung and the wood-lock nailed in its place it cannot rise, because the latter butts against the under side of the brace and butt of the score.

Wrain Bolts.— Ring bolts, used when planking, with two or more forelock holes in the end for taking in the sett, as the plank, etc., works near the timbers.

Wrain Stave or Staff.— A kind of stout billet of tough wood, tapered at the ends so as to go into the ring of the wrain bolt to make the setts, necessary in setting or tightening up the planks or thick stuff to the timbers.

Part II

Masts and Rigging

A

After Sails.— The sails on the masts that are abaft the foremast.

After Yards.— The yards on the masts which are abaft the foremast.

Anchor.— The implement that holds a floating vessel to the bottom by means of a connecting cable. It usually consists of a main shaft or shank, which has at one end diverging arms which terminate in flukes, and a stock of wood or iron at the other end at right angles to the shank and also to the plane of the arms. The shank projects above the stock and forms the head, in which is a ring or shackle. That part of the shank at the junction of the arms is called the crown.

Arms.— One of the projecting members of an anchor, ending in a fluke. An end of a yard.

B

Baby Jib Topsail.— Yachts generally carry three sizes of jib topsails, viz., baby, working, and balloon.

The baby jib topsail is as its name implies the smallest sail.

Backbone.— A rope that is stitched to the back of an awning and runs fore-and-aft. To this rope the crowfoot is spliced, by which the awning is triced up.

Back Ropes.— Ropes that lead from the dolphin striker on the lower end of the martingale to steady it and which set up on the bows.

Backstay Stools.— Small separate channels abaft the main channels used for setting up the standing backstays.

Backstays.— Ropes which are attached to all mastheads above the lower mastheads, and lead down to the vessel's sides for the purpose of steadying the masts.

Bagpipe.— The mizzen is said to be bagpiped when its sheet is brought to the weather mizzen rigging.

Bag Reef.— A name sometimes applied to the lower reef in the fore-and-aft sails and the upper reef in square topsails.

Bale Band.— A big shackle-shaped iron at the masthead, supported by the capband, and to which the standing part of the flying jib stay is bent.

Bale Sling.— A simple strap or rope, the ends of which have been spliced so as to form a continuous piece. It is doubled and passed around a bale or bag, the two ends meeting on top, where one end is slipped through or under the other. The hook of the hoisting block is hooked into the loop, and the strap tightens around the bale or bag when it is hoisted.

Balance Reef-Band.— A reef-band on a gaff-sail, which runs across it diagonally. It is used in bad weather and makes the sail triangular.

Balloon Foresail.— A sail made of light canvas, and carried in place of the regular fore staysail.

Banding.— The band of canvas which is sewed over the tabling on the head, luff, and foot, and on the leach from the clew up above the reef cringles.

Barrel.— The horizontal, revolving part of a windlass; the main piece of a capstan; or the horizontal piece around which the tiller ropes go, and which is turned by the steering wheel.

Barrel Sling.— A simple sling made for hoisting a headless barrel. This is much used on board ships to send hold-sweepings up on deck in a barrel, etc.

Bend.— To fasten, to secure one rope to another rope, spar, etc. Bending sail is to secure a sail to a yard, or to a boom and gaff.

Bentick Shrouds.— Ropes seized to the weather futtock staves and set up or made taut to the lee channels for the purpose of steadying the mast, when the vessel is rolling heavily.

Bibbs.— Pieces of timber that are bolted to the hounds of the mast for the trestletrees to rest upon.

Binnacle.— A stand of wood or brass in which the compass rests.

Binnacle Hood.— The glass front cover to the binnacle stand and into which the binnacle lamps are fitted.

Binnacle Lamp.— The small lamp that fits into the binnacle hood and lights up the compass.

Bitt Heads.— The upper ends of bitts.

Bitt the Cable.— To confine the cable to the bitts by one turn under the cross piece and another turn around the bitt head. When in this position the cable may be either let run out or kept fast.

Bitter End.— The extreme end of a rope or cable; when the end of the rope by which the vessel is riding is secured to the bitts, the cable is said to be paid out to the bitter end.

Bitter.— To bitter a rope or cable is to take a turn with it around the bitts.

Bobstays.— The chains or ropes which lead from the lower outboard end of the bowsprit to the stem where they are secured, and by which the bowsprit is held down and kept from jumping.

Bolsters.— Pieces of soft wood, sometimes covered with canvas, which are placed under the trestletrees, and on which the eyes of the rigging rest, so as to prevent chafing.

Bolt.— A roll of canvas is called a bolt, and contains thirty-nine yards, whatever may be the width.

Bolt Rope.— The rope that goes around the edge of the sail and to which the latter is sewed.

Bonnet.— A piece of canvas which, as a supplementary sail, is laced to the foot of the head sail, and which is taken off in heavy weather.

Booby Hatch.— A wooden hood which covers a small after hatchway, which is used to obtain access to the interior of the vessel without removing the main hatches.

Boom.— A spar used to extend the foot of a fore-and-aft sail or a studding sail, pronounced stun'sail.

Boom Brace.— A rope that leads from the end of the studding-sail boom through a tail block in the main rigging.

Boom Foresail.— A fore-and-aft foresail having its foot spread by a boom.

Boom Horse.— An iron half-circle which is secured to the iron band of a boom for the sheet traveler (the iron ring on the end of the boom sheet block) to traverse on.

Boom Irons.— Iron rings or collars at the extremity of the yardarms and through which the studding-sail booms travel.

Boom Jiggers.— A light tackle used for rigging out and in the studding-sail boom.

Boom Mainsail.— A fore-and-aft mainsail, which has its foot spread by a boom.

Boom Topping Lifts.— Whips which lead from the after end of a boom through a block to the lower masthead, thence down on deck, and are employed for topping up the boom and taking the strain off the sail when the latter is set, and the strain off the peak halyards when the gaff is lowered and the sail tied up.

Boom Tackle.— A double purchase used to guy out booms, when the vessel is running, so that they will not come abroad. Also known as boom guys and lazy guys.

Bowed.— A mast or yard is said to be bowed when it is set up so taut as to spring it.

Bow Lighthouses.— The towers placed on each bow of the vessel, and inside of which is contained the lamp for illuminating the colored-glass window. These towers are a great improvement over the side-light lanterns. They are also known as side-light castles and side-light towers.

Bowline.— A noose made in a rope with a certain kind of knot. A rope attached to the bridle on the leach of a square sail for the purpose of hauling the leach forward so as to sail as close as possible to the wind. When sailing this way a vessel is said to be on a bowline. To steady out a bowline is to hold it taut.

Bow Line or Bow Fast.— A rope leading over a vessel's bows to another vessel or wharf, and by which the forward part of the vessel is made fast.

Bowline Bridle.— A span of rope connecting a bowline with the two cringles on the leaches of a square sail.

Bowline on a Bight.— A double bowline.

Bowline Lizard.— A short rope pendant with a thimble spliced in one or both ends. It is a part of the bowline bridle.

Bowline Knot.— A loop knot made in the end of a rope.

Bowline Cringle.— Eyes worked in the boltrope on the leaches of square sails, and in which the bowline bridle is made fast.

Bowsprit Cap.— The iron band fitted to the outboard end of the bowsprit, with a ring on top for the jib boom to run through.

Bowsprit Bitts.— Perpendicular timbers which extend above the deck, and between which the heel of the bowsprit is secured.

Bowsprit Shrouds.— The ropes that lead from the side of the bowsprit cap back to the bows of the vessel, where they are set up or fastened, and which stay the bowsprit sideways.

Brace.— Rudder gudgeons are sometimes called braces. They are ropes leading from the yardarms to the deck, and by hauling on which a yard is turned around at various angles to the keel and held in place.

Brake.— The lever used for working a deck pump.

Brails.— Ropes used to gather up fore-and-aft sails into the mast. Spankers are provided with brails. There are foot, throat, and peak brails.

Breast Fast or Breast Line.— A rope used to secure a vessel's side to a wharf, etc.

Breech.— The outer angle of a knee timber; the bottom of a block, where the standing part of the tackle is made fast to the block.

Bridge.— A platform that extends across the deck on steam vessels, which is raised considerably above the rail of the ship. It is for the convenience of the officer of the watch, from which altitude he superintends and manages the vessel. The steering bridge is the bridge on which is placed the steering wheel. Some steamships are provided with two bridges, one above the other, and when this is the case the lower one is made the steering bridge.

Bridle.— A span of chain or rope with the ends secured, thus forming the bridle. The hauling power is applied to the bight of the bridle.

Bumpkins or Boomkins.— Short horizontal spars projecting from the vessel's sides, to board or haul down the fore tack to and from each quarter, that the main brace blocks may be secured to them.

Bull's-Eye.— An egg-shaped piece of wood, having a hole in it for a rope to reeve through. A bull's-eye has no sheaves but is stropped the same as a block.

Bulwark Netting.— A framework of ratline stuff seized in diamond shape and used instead of bulwarks.

Bunt.— The middle of a square sail that lies on top of the yard, when the sail is furled.

Buntlines.— Ropes toggled to the foot of square sails and used for lifting the foot of the sail to the yard. The buntlines lead through blocks above the yards, thence down to the deck.

Bunt Lizard.— A piece of rope having two legs with a thimble spliced into the end of each, and made fast to the topsail-tie. The buntlines reeve through the thimbles which act as fair leaders.

Bunt Jigger.— A purchase used to lift the bunt of heavy square sails to the yard in furling.

Bunt Whip.— A whip employed to lift the bunt of light square sails to the yard in furling.

Burton.— A tackle used for various purposes. A single Spanish burton is made of three single blocks. A double Spanish burton of three double blocks.

C

Cable.— A rope or chain attached to the anchor.

Cable Tier.— The place on a ship where the cable is stowed.

Cabin.— The part of the vessel in which the officers have their quarters.

Caboose or Galley.— A house on the deck where the cooking is done.

Canvas.— The material of which sails, awnings, etc., are made.

Cap.— A leather, canvas, or metal, shaped like a thimble, which is placed over the ends of the standing rigging, such as the brass acorns on the ends of the lanyards of the lower rigging. A block of wood that has in it both a square and a round hole and is used to confine two masts to each other. The square hole is fitted over the lower or topmast head and strongly secured, and the round hole permits the topmast or topgallant mast to run through it. The bowsprit cap is at the outboard end of the spar and secures the jib boom to the bowsprit.

Carrick Bend.— Used for bending two hawsers together.

Carrick Bitts.— The windlass bitts.

Cat Block.— The double or threefold block which forms part of the tackle used in hoisting the anchor to the cathead.

Cat Crane.— An iron overhanging beam stepped like a boat davit, and used in place of a cathead for catting the head.

Cat Harpin.— Short lengths of rope, which are used for bending in the rigging abreast of the topsail yards, in order that those yards may be braced up as sharp as possible.

Cathead.— Horizontal timbers projecting from a vessel's bows, and to which the anchor is raised and secured after it has been hove up.

Cat Hook.— A large hook fitted to the strop of the cat block which is hooked into the anchor ring, when catting or hoisting the anchor, to lift the latter to the cathead.

Cavil.— A length of timber like a long cleat, which is bolted onto the bulwark stanchions in a fore-and-aft direction and to which ropes are belayed.

Cavil Heads.— Timber heads when they are used as cavils.

Chafing Gear.— Rope, canvas, etc., placed upon the rigging, spars, etc., to save them from being chafed.

Chains.— Strong narrow plates of iron bolted to the ship's timbers through the sides. To the upper ends of these plates, dead-eyes are secured by an iron strap. The ship's channels are also called chains, such as fore chains, main chains, and mizzen chains.

Cheek Blocks.— Half of a shell containing the sheave bolted onto a spar, the latter acting as the missing cheek.

Cheeks.— Those projections that are bolted to the sides of the masts and upon which trestletrees rest. Also the name applied to the two sides of a block.

Chess Trees.— Pieces of oak bolted to the topsides of the vessel, containing a sheave, and formerly used to haul home the main tack. Not used now.

Cramps.— An iron shape which works on a hinge and is used to confine a spar, such as a studding-sail boom.

Clew.— The lower corners of a square sail and the after lower corner of a fore-and-aft sail.

Clew Cringle.— A shackle spliced into the clew of the sail, which is the junction of the foot and leach.

Clew Garnet.— The rope by which the clews of a foresail and mainsail (courses) are hauled up to the yard. The clew garnet takes the place of a clew line on the courses.

Clew Lines.— The ropes that lift the clews of square sails to the yards; the clew line bunches the gaff-topsail on a fore-and-aft vessel.

Club Topsail.— A topsail which is set flying from the deck, the luff of which is laced to a pole called a sprit, and the foot laced to a pole called a club.

Collar.— The eyes in those ends of the standing rigging that go over the mastheads are sometimes called collars. Also, a strap or grommet, when used to seize a heart or dead-eye.

Concluding Line.— A small rope which runs through the center of the steps of a stern ladder or Jacob's ladder.

Cordage.— A term which is applied in a general way to all the standing and running rigging.

Counter Brace.— To brace the head yards one way and the after yards another.

Courses.— The sails upon the lower yards of a vessel, thus the foresail is the fore course, the main sail the main course, and the crossjack the mizzen course.

Cringle.— A short piece of rope spliced into and forming an eye on the bolt-rope of the luff, head, tack, clew, and leach of gaff-sails; into the head, foot, and leaches of square sails; and into the head, tack, and clew of jib-headed sails. An iron ring, called a thimble, is contained within the eye to prevent chafing.

Crossjack.— The lower yard on the mizzenmast of a ship. It is pronounced as though spelled crog-ic. Some merchant ships carry a sail on the crossjack.

Crosstrees.— Pieces of oak running thwartships which are supported by the cheeks and trestletrees, and by which the tops of the lower masts are supported. They spread the topgallant rigging at the topmast head.

Crowfoot.— A number of small lines suspending an awning, which are either spliced into or hooked to little thimbles on the awning backbone; these lines reeve through an euphroe, to which is bent or hooked the awning halyards, by which the canopy or awning is triced up.

Crow's-Nest.— A look-out perch at the masthead of whalers. It is generally made something like a barrel, minus the head, and so rigged as not to interfere with the sails. A telescope is provided for the use of the seamen who occupy it.

Crutch.— The stanchion which is forked at the upper end for a spar to rest in; the after boom rests in a portable crutch when the vessel is at anchor with no sails set.

Cuckhold Neck.— The knot by which a rope is secured to a spar; the two parts of the former cross each other and are seized together.

Cut Splice.— A splice made with two ropes, one of which is a short length. The latter has both its ends spliced into the bight of the other, thus forming a kind of eye splice.

D

Dasher Block.— A small block at the end of the after gaff, used for reeving the ensign halyards.

Davit Guy.— A light rope secured to the outer eye on the side of each davit, and set taut on the rail by a lanyard so as to keep the davits at right angles to the keel. The davit check or spreader, which crosses horizontally from davit to davit, prevents them from turning too far when the guys are set up. Sometimes a light spar, called a strong back, is used to spread the davits instead of a chain.

Davits.— Those lengths of timber or iron on a ship from which boats are suspended.

Dead-Eye.— A solid circular block, without sheaves, but containing three holes through the flat, and a score or grove cut around it for a strap. It was formerly used on the ends of chain plates, shrouds, and stays set up with lanyards. Turnbuckles are nearly always used now instead of dead-eyes.

Dead Lights.— Round thick glass windows in the sides of the vessel.

Dead Rope.— A rope that does not reeve through any block or pass over any sheave.

Deck Bull's-Eye.— Thick shapes of glass fitted into holes in the deck to let light into the vessel. Deck lights are almost the same things.

Deck Pipe.— A hole in the deck through which the cable leads.

Deck Tackle.— A heavy double purchase which is used for heavy work on the deck.

Derrick.— A spar supported by guys with a block at its upper end, which forms part of a tackle for handling cargo.

Devil's Claw.— A strong bifurcated iron hook used as a stopper for the cable.

Dipping Lug Sail.— One that has to be shifted to leeward of the mast each time the vessel is tacked.

Dog's Ear.— The small bight which is made in the leach rope of a sail, when it is reefed or made up.

Dolphin Striker.— The lower spear-shaped end of a martingale.

Double Block.— One that contains two sheaves.

Downhaul.— A rope used in hauling down jibs, staysails, and studding sails.

Drabbler.— A piece of canvas laced to the bonnet of a sail in the same manner that the bonnet is laced to the sail itself. It is employed to obtain more drop or depth of sail.

Drawing String.— The rope that runs along the leach of foresails, mainsails, and jibs. It is spliced into the head cringle, and leads down through the space in the tabling between the boltrope and the sewing of the seam. It then leads out through an eyelet hole in the clew. It is used to strengthen the leach and prevent that part of the sail from slapping when the leach is too slackly roped, or when the body of the sail is shrunken with dampness.

Drift.— The length of rope which is over and above the portion used.

Driver.— A term sometimes applied to the spanker. The name is derived from the large square sail which formerly was set on a yard on the end of the spanker boom.

Drop.— The depth of a square sail amidships from head to foot. This term applies to courses which do not hoist but drop.

E

Earing.— A rope which fastens a reef-band or the corners of a sail or awning to a yard, gaff, or stanchion. They are named from their uses, reef-earing, nock-earing, head-earing, tack-earing, etc. The cringle of a sail is thus secured in bending and reefing.

Elliott Eye.— An eye in the end of a hawser, that contains a thimble.

Ensign Halyards.— The halyards by which the ensign is hoisted, whether the latter is shown at the stern or at the peak.

Euphroe.— A length of wood having a number of parallel holes bored in it, and used to spread the legs of the awning crowfoot.

Eyelet Holes.— Small holes worked in a sail, and through which the reef points are run for half their length, then sewed to the eyelet hole; also the holes for the robands to go through in bending the sail.

Eyes.— The loop in a shroud or stay that goes over the masthead; the hole in the top part of the anchor shank that the ring goes through. The eyes of a ship are the hawse holes. Up in the eyes, refers to the extreme forward part of a vessel, either above or below decks.

F

Fair Leader.— A short length of wood with holes bored in it, or a block or thimble so placed as to give running rigging a fair lead, or to change its direction a little, such, for instance, as to make it parallel to the shrouds by gathering it into them through the fair leader.

Fall.— The rope of a tackle, to which power is applied.

Fancy Line.— A line for drawing over the lee topping lift of the main or spanker boom; a line rove through a block seized on the jaws of a gaff, and used as a downhaul or to haul down the spar.

Fast Secure.— The rope used to secure a vessel to a wharf, etc.

Fid.— A block of wood or iron, used to support a topmast or a topgallant mast by placing it through the fid hole in the heel of the mast and allowing it to rest on the trestletrees. Also a conical pointed piece of hard wood used as a marline spike for splicing large ropes, opening the eyes of rigging, etc.

Fiddle Block.— An elongated shell containing two sheaves, of which the larger one is above the other.

Fife Rail.— The rail that surrounds the mast for holding belaying pins, etc.

Filler.— A piece of wood inserted in a made mast to make good a deficiency. Also a composition used on spars before painting or varnishing.

Fish Front.— The name of a strengthening slab on the front of a made mast.

Fish Tackle.— The ropes, blocks, hook, etc., used in fishing or raising an anchor.

Fisherman's Bend.— Sometimes used for bending on the gaff-topsail halyards, or the topmast studding-sail halyards.

Fleet.— To separate the blocks of a tackle.

Flemish Horse.— The small extra footropes at the ends of the topsail yards.

Flying Jib.— One of the head sails, that sets outside the jib on the jib boom.

Flying Jib Boom.— The light spar that rests on the jib boom, and is rigged out ahead of the latter.

Flying Jib Stay.— A stay forward the foremast, on which the flying jib is set.

Flying Kites.— Skysails are sometimes so called.

Foot.— The lower edge of a sail, or that part of a mast near the deck.

Footropes.— Lengths of rope made fast to and hanging under a yard or along the bowsprit, or the spanker boom, and jib boom, for men to stand on while bending, unbending, reefing, and furling sail. These ropes were formerly known as horses. The bights are supported by stirrups hanging from the spars.

Fore-and-Aft Sails.— The sails which set upon gaffs, booms, and stays.

Fore Rigging.— The shrouds and their ratlines of the fore lower mast.

Foresail.— The sail that on a square rigger is bent to the fore yard; but on a "fore-and-after" it is the sail which is spread by the fore gaff and boom.

Fore Shrouds.— The shrouds of the fore lower mast.

Fore Stay.— The hemp or wire rope leading from the head of the foremast to the stem, where it sets up. The foremast is stayed forward by it, and on this stay the fore staysail is set.

Fore Staysail.— The first head sail forward of the foremast, setting on the fore stay.

Fore Topmast Staysail.— A head sail that sets upon the fore topmast stay.

Fore Yard.— The lowest yard across the foremast on a brig, ship, etc.

Foremast.— The forward mast on all vessels. As sloops and cutters have but one mast, it is always called the mainmast.

Foul.— A rope fouls when it jams in a block; a term used to express the opposite of clear.

Four-Fold Block.— A block that contains four sheaves.

Four-Fold Purchase.— A purchase which has two blocks of four sheaves each.

Furl.— To roll up and secure a sail or awning.

Furling Line.— A small line, used to bind a fore-and-aft sail to a gaff or boom after it is furled. Short independent lengths of rope used for this purpose are called stops, and when used for square sails they are called gaskets.

Furniture.— The rigging, spars, anchors, sails, boats, cables, etc., of a vessel.

Futtock Band.— The iron band which goes around the lower mast just under the top, and to which the futtock shrouds are fastened.

Futtock Chain Plates.— Iron plates, which are secured to the side rims of the tops, with a dead-eye in the upper part for the topmast rigging to set up to, exactly the same as the chain plates of the lower rigging, and a hole in the lower end, into which the futtock shroud is hooked.

Futtock Holes.— Holes in the rim of the top on each side for the futtock chain plates.

Futtock Shrouds.— Short shrouds, which extend from the lower ends of the futtock chain plates to the futtock band.

Futtock Staff.— A length of wood or iron covered with canvas or leather, seized across the topmast rigging like a sheer pole.

G

Gaff.— A spar which projects abaft a mast, and to which the head of a fore-and-aft sail is bent. That part of the gaff which is near the mast is called the throat, and the outer end of the spar is named the peak. It is hoisted by throat and peak halyards. The jaws are the two horns bolted one on each side of the inner end of the spar to keep it to the mast. The rollers are the little wooden wheels on the forward side of the mast, which are strung on a jaw span or jaw rope made fast through holes bored in the forward extreme ends of the jaws. This span prevents the gaff from unshipping with a fore-and-aft motion, and the rollers do not permit the span to jam against the mast when the gaff is being hoisted or lowered.

Gaff Topsail.— A fore-and-aft sail set over a gaff, the foot of the former being spread by the spar.

Gang.— A set of standing rigging is known as a gang of rigging.

Gantline.— A line that reeves through a temporary single block hooked aloft. Also called a girtline.

Garnet.— A purchase rigged on the mainstay and used in handling cargo.

Gaskets.— Ropes employed to secure the square sails to a yard, or the head sails to the bowsprit and jib booms after the sails are furled. Sometimes the bowsprit is provided with stops made fast to small iron screw eyes on the sides of the spar, and these take the place of gaskets; but gaskets are always used on jib booms and on yards. On the latter they are named according to their location, as bunt, quarter, and yardarm gaskets. Harbor gaskets are made of platted stuff or bands of canvas, for use when the vessel is in port. Sea gaskets are ropes.

Gear.— The ropes, blocks, tackles, etc., of any particular spar, sail, etc., spoken of collectively.

Gimbals.— A pair of rings, one of which swings within the other, their respective axes being at right angles to each other. One of the rings provides for the roll of the ship, and the other for the pitch. The compass is suspended within them so it will be horizontal.

Glut.— A piece of canvas having an eyelet hole worked in it and sewed into the middle of a square sail near the head. A becket is made through this hole and a bunt jigger is hooked into it.

Goose Neck.— A kind of hook made of iron and fastened to the inner end of a boom having no jaws, also to the inner or lower end of a spinnaker boom.

The goose neck confines the end of the boom by being secured to an iron clamp or eye on the mast. Independent steps for spinnaker boom goose necks are found on yachts, the steps fastening to the deck.

Goose-Winged.— When the clew of a course or topsail is hauled up and lashed to its yard, the sail is said to be goose-winged.

Goring Cloth.— Pieces of canvas cut on the bias and added to the sail.

Gores.— Angles cut slopewise at one or both ends of cloth in sail-making, so as to widen or increase the depth of a sail.

Ground Tackle.— A term applied collectively to all the anchors, cables, anchor purchases, etc.

Gun-Tackle Purchase.— A purchase, which is made of a length of rope and two single blocks.

H

Halyards or Halliards.— The ropes or tackle used for lowering and hoisting yards, gaffs, and sails. They are named from their use or position, as ensign halyards, etc.

Hanging Blocks.— Blocks which are used at the mastheads for the halyards of the head sails.

Hanks.— The rings of wood, rope, or iron around a stay, and to which the luff of the head sails is secured by robands.

Harness.— A name for the rigging of a vessel.

Hauling Line.— A line sent down from aloft to haul articles up.

Head Boards.— The boards placed inside the hammock nettings at the forward and after ends.

Head Cringle.— The iron ring or shape which is spliced into the boltrope at the junction of the leach and head of a fore-and-aft sail, and at the two upper corners of a square sail.

Head Earings.— The ropes which secure the two upper corners of a square sail to the yardarms by alternate passings of the line through the head cringles and the spar.

Head Room.— The height of any place, as for instance from the floor to the roof.

Head Rope.— The rope to which the tabling on the upper edge of a sail is sewed.

Head Sails.— All the sails forward of the foremast. These are named differently on vessels of various rigs. They are called, fore staysails, fore topmast staysails, jibs, flying jibs, jib-o-jibs, inner jibs, main jibs, outer jibs, jib topsails, middle jibs and standing jibs.

Head Sheets.— The sheets of all the head sails.

Head Stick.— The small round spar, about fifteen inches long, which is seen on the heads of some spinnakers and jibs. The triangle or apex at the head of the sail is cut off straight across, and the edge tabled and worked with eyelet holes, then laced to the spar in the center of which the halyards are bent. Its use is to prevent the heads of the above sails from twisting, as they are very apt to do on account of their luff not being confined to a stay.

Head Yards.— All the yards on the foremast.

Heart.— A block of wood shaped like a heart and stropped, having a hole through it for stays to reeve through. Also the strand running through the center of a four-strand rope.

Hitch.— A way of fastening rope around a spar or other object.

Hoist.— The length of the luff of a fore-and-aft sail; the distance in feet from the jaws of the boom

to the jaws of the gaff, when the sail is hoisted. It applies to the midship depth of those square sails the yards of which travel up and down the masts.

Horns.— A name by which the jaws of the booms and the ends of crosstrees are known.

Hounding.— The hounding of a mast is all that part of the mast between the heel and the lower part of the head.

Hounds.— Projections bolted onto the masthead, which serve as shoulders for the trestletrees, which in turn support the top.

House.— To house a mast is to lower it partly and secure its heel by lashing to the mast against which it is lowered.

Housing.— The housing of a mast is all that part which is below the spar or upper deck; the housing of a bowsprit is that part inboard from the stem.

I

Inner Jib.— The head sail which is next forward of the fore staysail on some merchant sailing vessels.

Irish Pennant.— The loose end of a rope which hangs out of a sail or from a yard in a slovenly manner.

J

Jack.— A horizontal bar of iron at the topgallant masthead, which is placed there in order to give spread to the royal shrouds.

Jack Block.— A block that is kept hooked aloft, through which to reeve the topgallant and royal yard ropes when those spars are sent up or down.

Jack Crosstrees.— Iron crosstrees such as are to be seen at the head of the topgallant mast.

Jack Rope.— The foot of some fore-and-aft sails is secured to the boom by a line called a jack rope, running fore-and-aft through the eyes which are screwed in on top of the spar, and through the little thimbles which are sewed on the boltrope on the foot of the sail at every seam.

Jackstays.— These are long strips of wood or iron bolted on the top of a yard to bend the head of a square sail to, and to the under part of a gaff for the head of a fore-and-aft sail. Formerly jackstays were lengths of rope stretched along a spar.

Jacob's Ladder.— A ladder with rope sides and wooden rungs, used for getting into the lower rigging on vessels with very high bulwarks, and for

getting up to the jack crosstrees. The ladder hangs abaft the mast.

Jaw Rope.— The span of rope that is attached to the jaws of a gaff, and sometimes to a boom, on which little hard wooden wheels called rollers are strung like beads.

Jaws.— Pieces on the inner end of a gaff, and also of some booms. They are bolted onto the sides of the spar. Also called horns.

Jeer.— A tackle for swaying or striking a lower yard. The term is mostly used in the plural.

Jeer Bitts.— Bitts to which jeers are belayed.

Jeer Blocks.— These are double or treble blocks belonging to the jeer falls.

Jeer Falls.— The ropes rove through the jeer blocks, which together form the jeers.

Jewel Blocks.— Small blocks at the yardarms for the studding-sail halyards to reeve through.

Jews-Harp.— The peculiar shackle which connects the cable with the anchor ring.

Jib.— A triangular sail that sets on a stay forward of the foremast.

Jib Boom.— A spar which is supported on and rigged out beyond the bowsprit through the bowsprit cap.

Jib Boom Guys.— Ropes which are used to steady the jib boom sideways. They lead from the end of the spar through the whiskers on the end of the bowsprit, and thence to the bows of the vessel, where they set up. Flying jib boom guys act in the same way for the flying jib boom.

Jib-Headed.— The term applies to the cut of the sail, and means that the head of it is shaped like that of a jib.

Jib Netting.— A safety netting under the jib boom, which is seized to the jib boom guys and the whiskers. The flying jib boom netting is rigged under the flying jib boom, being seized to the flying jib guys. These are seldom used except on naval vessels.

Jib-O-Jib.— A triangular sail, carried on some merchant schooners, which sets on the last stay forward of the foremast.

Jib Stay.— A stay forward of the foremast, on which the jib is set.

Jib Topsail.— A triangular sail, which sets on the extreme forward end of the flying jib boom.

Jib Traveler.— The large iron ring to which the tack of a cutter's jib is made fast. The ring goes around the bowsprit and runs in and out on the spar by means of an outhaul and an inhaul; this jib is always set flying.

Jig.— An extra purchase made fast to one end of the throat and peak halyards. The bight of the halyards is rove through the blocks, and the two ends are let down on deck, one on each side of the mast. One of these ends is the regular hauling part, and the other end has a purchase to it which is called the jig.

Jigger.— A handy billy tackle that is used about decks. A sail that sets on a jigger mast.

Jigger Mast.— The aftermost mast on a four-masted vessel. Also the small mast carried on the stern of yawls.

Jumper.— A rope which leads from the outboard ends of the whiskers to the martingale to prevent the former from steeving, or leaving a horizontal line by jumping upward.

Jumper Stay.— Extra stays which lead from the lower mastheads to the sides of the vessel, where they are set up with tackles.

L

Lacing.— The rope that is used to lash the head of a fore-and-aft sail to a gaff, to secure a bonnet to a sail, etc.

Lanyards.— A rope rove through the dead-eyes in setting up rigging; a rope made fast to anything for securing it, as the lanyards of the davit guys.

Lark's Head.— A knot made by doubling the bight of a rope, passing it around a spar, or through a ring or hook about a foot; then bending it down toward you and spreading it out, and slipping a toggle through the four parts, across the two outer and under the two inner. It is finished by taking a half hitch around the standing part, with the loose end hanging down so that it will not slip when a strain is put on it.

Latchings.— The rope loops on the head of a bonnet, and with which it is laced to the foot of the sail.

Lateen.— A rig similar to that of the lugger except that the sail is triangular. A long yard that hoists obliquely to a mast forms the luff.

Lay.— The direction in which the strands of a rope are twisted.

Lazy Guy.— A name sometimes applied to the boom guy or boom pendant.

Lazy Jacks.— The lengths of rope rove through thimbles seized onto the boom topping lifts and made fast to the boom. When the sail is lowered they prevent the folds of canvas from falling on the deck.

Leach or Leech.— The edge of a square sail at the sides and the after edge of a fore-and-aft sail. The luff of a sail is often called the forward leach, and the leach proper is termed the after leach. Among English seamen this is universal.

Leach Line.— A line that is made fast to the leach ropes of sails and passes up through blocks on the yards to haul the leaches up by.

Leach Rope.— The roping on the after edges of fore-and-aft sails, and on the sides of square sails.

Leading Part.— The part of the tackle that is hauled upon.

Leefange.— This is a deck horse. Also a rope made fast to the clew cringle of a jib in order to hold it, or haul it flat amidships, while the bonnet is being laced.

Left-Hand Rope.— A rope that is twisted from left to right.

Life Lines.— Ropes stretched along the deck, to which the crew may hold and thus save themselves from being washed overboard during heavy gales when the vessel is shipping seas. Also horizontal ropes stretched between the yard lifts and the mast, about four feet above the yard, as a support for men on board a ship of war when they are manning yards. The line shot over a stranded vessel by a life-saving crew.

Lift.— A rope extending from a yardarm to the mast to support the yard, and by means of which the yard may be topped up, etc.

Light Sails.— All the sails above the topsails, also the studding sails and flying jib.

Lines.— Ropes used for various purposes aboard ships, and known as head-lines, bow-lines, breast-lines, quarter-lines, stern-lines, bunt-lines, clew-lines, leach-lines, spilling-lines, towing-lines, hauling-lines, tripping-lines, etc.

Lining Cloth.— Extra pieces of canvas sewed on the back of square sails to take the chafe.

Lizard.— A length of rope having one or more thimbles spliced into it and used as a leader for ropes.

Long Splice.— Joining two ropes together by interweaving their strands so that no bulge exists.

Lower Mast.— This is the first mast above the deck, which is stepped into the keel. The lower masts are named from their position in the ship, lower foremast, lower mainmast, lower mizzenmast, etc.

Lower Rigging.— The shrouds and the ratlines that belong to the lower masts.

Lower Shrouds.— The shrouds of the lower fore, main, and mizzen masts.

Lower Yards.— The foreyard, main yard, and crossjack.

Lubber's Hole.— An opening in the top next to the mast and through which the shrouds pass after going over the lower masthead. It is sufficiently large for the passage of a man. To get into the top through the lubber's hole instead of over the top-rim by the futtock shrouds is considered very unseaman-like, and anyone doing so is called a lubber by his shipmates.

Lubber's Point.— The black vertical line which is painted on the inside of a compass bowl, and which represents the vessel's head to the helmsman.

Luff.— The forward edge of the fore-and-aft sails, often called the forward leach. The luff of the bow

is the place where the rail begins to curve toward the bow.

Luff Cringle.— The iron ring or shape which is spliced into the boltrope of a gaff, or into a fore-and-aft sail at the junction of the head and luff. Jib-headed sails have but three cringles, viz., head, tack, and clew.

Luff Tackle.— A tackle formed of a length of rope and a double-and-single block. It is used in various ways.

Luff Upon Luff.— One luff tackle applied to the fall of another luff tackle.

Lug Foresail.— A sail which takes the place of the regular working foresail on a schooner. It is cut long on the foot so as to sheet about six feet abaft the mainmast, and is sometimes bent onto the fore boom as far as the spar goes.

Lugger.— A vessel of one, two, or three masts with quadrilateral or four-cornered fore-and-aft sails, which are bent to a hoisting yard, the luff being about two-thirds of the length of the leach.

M

Made.— A made mast is composed of different pieces of timber, likewise a made block. Topmasts and topgallant masts are nearly always whole spars.

Magnus or Magner's Hitch.— A round turn around a spar, the turn itself being jammed or fastened by a half-hitch.

Main Rigging.— The shrouds and ratlines of the main lower mast.

Mainsail.— The sail that on a " square-rigger " is bent to the main yard, and the sail that on a " fore-and-after " is spread by the main gaff and the main boom.

Main Shrouds.— The shrouds on the main lower mast.

Mainstay.— The hemp or wire rope that leads from the main masthead to the foremast near the deck where it sets up. The mainmast is stayed by it, and on this stay the main staysail is set.

Main Topmast Staysail.— The triangular sail that hoists between the fore and main masts on square-rigged vessels, and also on schooners.

Main Yard.— The lowest yard on the mainmast of a brig, bark, or ship.

Mainmast.— The mast that is next abaft the foremast on a vessel that carries two or more masts. The single mast carried by sloops, cutters, etc., is also called the mainmast.

Man Rope Knot.— A knot made in the ropes that are used in ascending and descending a vessel's side.

Man Ropes.— Those ropes that hang down from a vessel's side to assist in ascending, etc.

Marl.— To hitch a marline, spun yarn, etc., around the parcelling to keep it in place while it is being served.

Marry.— To sew the ends of two ropes together temporarily so that there will be no bulge and the joined rope will render through a block. This is done when reeving new signal halyards and saves a climb aloft.

Martingale.— Sometimes called Martingale boom. A short spar that hangs down from an eye-bolt in the bowsprit cap to give spread to the head stays. The martingale ends in a spear on the lower end, which is called the dolphin striker.

Martingale Stays.— Lengths of rope which are hooked or seized to the outer part of the jib boom and

lead to the lower end of the martingale, where they set up. They steady the martingale and keep the jib boom from jumping.

Masthead.— The top part of a mast, that part of a mast from the crosstrees to the cap. To masthead a man is to send him aloft to remain a certain length of time as a punishment. To masthead a yard is to hoist it by the halyards as far as it will go. This is done in making sail after the sail has been sheeted home.

Mast Hole.— A hole in the deck of a vessel, or in the thwart of an open boat, for the mast to go through.

Mast Hoop.— A wooden hoop that goes around a mast and to which the luff of a fore-and-aft sail is seized by robands. These hoops travel up and down the mast when the sail is hoisted and lowered. They are also called sail hoops.

Mast Rope.— A rope used in swaying up or striking a mast.

Masting.— Determining the positions in which the masts of a vessel are to be placed, also the mechanical process of stepping the masts.

Masts.— The spars which rise above the deck of a vessel perpendicularly, and which support the yards,

booms, gaffs, and sails. The lower masts extend from the keel where they are stepped to a height above the upper deck, and are secured sideways by shrouds, and fore-and-aft by stays. Masts are either whole or made.

Matthew Walker Knot.— A knot that is named after the originator and used on dead-eye lanyards.

Middle a Rope.— To double a rope in two equal parts.

Midship Tack.— An additional tack that is found on the middle of the foot of some courses. It is employed in calms and light airs to keep the foot of the sail hauled forward so as to prevent it slapping back and chafing itself against the mast, when the vessel pitches and rolls.

Mizzen.— The after fore-and-aft sail, which is also called the spanker.

Mizzenmast.— The after mast on a three-masted vessel.

Mizzen Rigging.— The shrouds and ratlines of the mizzen lower mast.

Mizzen Shrouds.— The shrouds of the mizzen lower mast.

Mizzen Stay.— The hemp or wire rope that leads from the mizzenmast head to the mainmast near the deck, where it sets up. The mizzenmast is stayed by it, and on this stay the mizzen staysail is set.

Monkey Block.— A small swivel block which contains one sheave and is stropped.

Monkey Gaff.— The light gaff that is placed above the spanker gaff on the mizzenmast of a ship, and projects from the topmast head. Signal halyards are rove through the end of this gaff.

Moon Sail.— A small sail which was once carried by very lofty ships. It set above the skysail.

Mortise Block.— A block which is made out of a single piece of wood by having a hole chiseled through it for the sheave to turn in.

Mouse.— A kind of washer put over a chain or rope to prevent the latter from slipping farther through an aperture.

N

Netting.— A rope network that is used aboard ships for various purposes, such as a bag to fasten to the foot of the fore topmast and jib stays on

board of a steamer, and into which those fore-and-aft sails are stowed instead of being furled. Also the bulwark network which takes the place of panels on steam vessels.

Ninepin Block.— A swivel block which derives its name from its shape.

Nip.— A twist in a rope.

Nippers.— A short length of rope used to secure a cable to the messenger.

Nock.— The name sometimes applied to the forward upper corner of a boom sail.

O

Outhaul.— The rope that hauls out the clew of some boom sails, the tack of a lower studding sail, and the head of a sail that brails into the mast.

Outer Jib.— The head sail, which is next forward of the inner jib on some merchant sailing vessels.

Out Rigger.— A spar, sometimes of iron, which projects from the crosstrees to give spread to the backstays, or any spar rigged out to give spread to rigging, like the whiskers or whisker booms on the

bowsprit, the spreaders on each bow for the jib sheets, etc.

Overhaul.— To separate the blocks of a tackle by coming up with the hauling part and pulling one block away from the other.

Oversparred.— When a vessel has heavier masts and yards or booms and gaff than are necessary, it is oversparred.

P

Pacific Irons.— These are studding sail boom irons.

Parcel.— Long strips of canvas used in parceling.

Parcel a Seam.— To lay a narrow strip of canvas over a seam that has been calked, to prevent it from filling with dust, etc., before it is payed.

Parceling.— To wind long strips of canvas around a rope preparatory to serving it.

Parral.— A rope or iron ring that confines a yard to the mast, but permits a vertical movement; in other words, which acts as a traveler for the yard when it is being hoisted or lowered in setting or furling sail.

Part.— To break a rope or cable.

Patent Block.— A block in which the sheave works on friction rollers; a circle of little revolving brass wheels as a bearing for the pin.

Paunch Mat.— A thick mat which is used to prevent yards and rigging from chafing.

Pazaree.— A rope that is used for guying out the clews of the square foresail when before the wind.

Peak.— The upper after or outer corner of a gaff-sail.

Peak Halyards.— The halyards on a fore-and-aft sail which hoist the outboard end of the gaff and straighten the leach.

Pendants.— A length of rope with a block or thimble stropped or spliced into one end, and the other end secured to the end of a yard, masthead, or outboard end of a gaff. The braces reeve through blocks on the ends of the brace pendants.

Pendant Tackle.— A tackle which is hooked to a pendant.

Pillow.— A block of timber on which the inner end of the bowsprit rests.

Pin.— The metal axle of a block.

Plain Sail.— The regular working sails of a vessel, and not such as are set flying like the studding sails, balloon sails, etc.

Point.— To taper the end of a rope.

Pole.— That part of the highest mast which is above the shoulder on which rests the eyes of the rigging. A topgallant mast has a royal pole and a royal mast has a skysail pole.

Pole Mast.— A lower mast and topmast in one piece.

Preventer.— A rope which is used as an additional support for a spar, as preventer braces, preventer backstays, etc.

Preventer Backstays.— Extra ropes which are used as stays during storms at sea for the greater security of the masts.

Q

Quarter.— That part of a yard that is just outside the slings. That part of the vessel's side near the stern.

Quarter Blocks.— Blocks, which are suspended under the quarters of a yard, as leads for the clew lines and sheets.

Quarter Lifts.— The double boom topping lifts, that lead from the iron band on that spar up to and through single blocks under the eyes of the rigging at the lower masthead, thence down on deck. The band is placed about one-fourth way from the end of the spar. Each hauling part is provided with a purchase.

Quarter Sheet Blocks.— The single blocks that are to be seen on some fore-and-aft vessels; which are secured to eye bolts in the deck on the ship's quarters. Through these blocks the main sheet reeves in addition to the boom and traveler blocks, and they are used to secure an additional purchase on the boom. When fitted this way the bight of the sheet is rove through the boom and traveler blocks, and the two hauling ends lead through these quarter blocks and make fast on the quarter bitts.

R

Rack.— To seize two ropes together with turns of yarn, etc., so they cannot move.

Rack Block.— A length of wood which contains a number of sheaves that are used as fair leaders.

Raffee Rail.— A sail in the shape of an equilateral triangle △, which is sometimes set over the highest yard. The foot of the raffee is spread by the yard, and the head or apex of the sail hoists directly in front of the mast. This sail is common to English schooner yachts that are rigged to carry a square sail, as the raffee is set over the yard.

Railways.— Iron jackstays bolted under the standing gaffs and used on steam vessels where booms are not carried. The head of the sail is hauled out along the gaff by means of an outhaul, and the sail is brailed in when it is desired to furl it.

Ratline Stuff.— A small tarred line that is used to rattle rigging.

Ratlines.— Short lengths of ratline stuff seized and clove-hitched, fourteen inches apart across the shrouds, parallel with the sheer poles, and which act as the rounds of a ladder for the crew in ascending or descending from aloft. All the ratlines extend from the swifter, viz., the forward shroud, to the one next to the aftermost shroud, but every fifth ratline is seized to this after shroud, and is called both a catch ratline and a sheer ratline.

Red Lead Putty.— A mixture of white and red lead used for various purposes, such as filling up deck seams after calking.

Reef-Band.— A band of canvas sewed across the sail in order to support the strain placed upon it by the reef points. It has earings at each end.

Reef Cringle.— Galvanized iron rings, called thimbles, which are spliced into the boltrope and the leaches of square sails, and on the leach and luff of fore-and-aft sails at the end of the reef-bands, and used to confine the ends of the reef-bands to the yard or boom.

Reef Earing.— On a square sail a reef earing is a small line used to secure the reef cringle to the yardarm. On a fore-and-aft vessel reef earings are short platted lengths of rope, which are passed through the reef cringle and around the boom several times so as to keep the leach of the sail secure to that spar after the reef points are tied and the sail again hoisted.

Reef Pendant.— A rope that is made fast to the reef cringle on the leach, and to which the reef tackle is hooked.

Reef Points.— The short cordage on the reef-bands used to tie up the sail in reefing. They are often called nettles.

Reef Tackle.— The tackle which holds the middle of the leach of a square sail up to the yard in reefing.

On a fore-and-aft vessel the reef tackle hauls the reef earing, on the leach of the sail, out along the boom.

Reeve.— To reeve a rope is to pass the end of it through a block, dead-eye, bull's-eye, or any aperture.

Relieving Tackle.— Tackles which are hooked to the tiller in a gale of wind, and by which the vessel may be steered in case of injury to the tiller ropes or wheel.

Render.— A rope renders when it passes freely through an aperture.

Return Sound Tubes.— These are tubes placed in the wheelhouse of a steamer and which run to the engine room to convey sounds, such as bells, etc.

Ridge Rope.— The rope rove through the holes in the upper ends of the awning stanchions to secure the sides of the awning to, when it is spread.

Rigging.— All the ropes of a vessel.

Rigging Luffs.— Watch tackle purchases which are used for setting up rigging.

Rigging Mat.— A mat that is seized to standing rigging to take the chafe.

Right-Handed Rope.— Rope that is twisted from right to left.

Ringtail.— A jib-headed sail the foot of which sets on an additional boom, rigged out on the end of the after boom. Its head hoists to the gaff, and the sail itself might be called a spanker-studding sail. It is rarely carried.

Roach.— The curve on the foot of a square sail. The roach of a fore-and-aft sail can be on any one of its sides.

Robands or Robans.— These are small pieces of manila or spun yarn, which are used to fasten the luff of a fore-and-aft sail to the mast hoops or stay hanks, and the head of a square sail to its yard. Also to secure the head of a fore-and-aft sail to a gaff fitted with a jackstay. Manila spun yarn is best.

Rolling Hitch.— A kind of three part heaving line bend.

Rolling Rope.— A rope that is used to steady light yards.

Rolling Tackle.— Tackle which is used during a heavy sea for steadying the yards. It is attached to the yards and used in various ways.

Rose Lashing.— A lashing that is made by passing the parts alternately over and under, and finishing by passing the end of the lashing around the crossing. Rose seizing means the same.

Round Line.— Three right-handed yarns used for heavy service, such as the eyes of rigging, heavy seizings, etc.

Round Seizing.— Seizing that is used on the eyes of rigging.

Royal.— A square sail that is next above a topgallant sail. A ship carries fore, main, and mizzen royals.

Royal Mast.— If it is a fidded royal mast, it is a separate spar rising above the topgallant mast; but otherwise it is that part of the topgallant mast above the shoulder, and terminating on the truck, from which the topgallant rigging leads. In the latter case it is also called a royal pole.

Royal Yard.— The yard that is next above the topgallant yard. The royal is bent to the royal yard.

Runner and Tackle.— A rope rove through a single block which there is a desire to bring down; one end of the rope is secured as a standing part, and the other provided with a tackle.

Running Bowline.— A bowline made over the standing part of its own rope, so that it will form a sliding noose.

Running Rigging.— Includes all the movable ropes of a vessel, such as braces, sheets, tacks, clew lines, bunt lines, leach lines, halyards, downhauls, reef tackles, outhauls, etc.

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Saddles.— These are pieces of wood, sometimes called crutches, bolted onto the sides of the masts near the deck to receive the weight of the boom jaws.

Sail Covers.— A covering of canvas, which is placed over the sails when they are furled to add to the neatness of their appearance and to protect them.

Sailmaker's Splice.— A splice made by sailmakers in uniting two ropes of different sizes.

Sails.— The canvas suspended from the yards, spread by gaffs and booms, and hoisted upon stays. The first are called square sails, the second fore-and-aft sails, and the third staysails.

Schooner.— A fore-and-aft schooner has no yards. All her sails are spread by booms and gaffs and by hoisting upon stays. A topsail schooner carries a fore-and-aft foresail and mainsail, a square fore topsail and topgallant sail, and sometimes a royal. A main topsail schooner carries a square topsail on the mainmast. Fore-and-aft schooners carry from two to five masts, and even more.

Score.— The groove that is cut in the side of a block for the strop to fit into.

Scotchman.— A piece of wood or hide placed over the turnings of rigging to prevent chafe.

Seize.— To seize a rope to another or to any object is to bind it with small stuff.

Seizings.— These are named according to position and use. There are throat, round, flat, and eye seizings.

Selvages.— Rope yarn or spun yarn marled together and used as a strop.

Sennit.— Rope yarn or spun yarn braided. There are several kinds, which are known as flat, French, round, and square. The name is derived from the way they are braided.

Serve.— The act of covering a rope by winding small stuff, such as spun yarn, around it.

Service.— The covering of a rope that has been served.

Set Up Rigging.— To tighten the shrouds and stays by the aid of purchases.

Shackle.— An iron shaped like a horseshoe, which is closed across the end with a movable bolt. It either secures with a thread in one of the eyes of the shackle, and is called a screw shackle; or is provided with a pin, which is slipped through the hole in the outside end of the bolt, or with a wooden pin, which passes through the shackle eye and bolt. The latter is used on chain cables.

Sheave (pronounced shiv).— The wheel within the shell of a block.

Sheave Hole.— The space between the cheeks of a block.

Sheep Shank.— A method employed to temporarily shorten a rope.

Sheer Pole.— A bar of metal that is seized across the shrouds and rests on top of the upper dead-eyes. The sheer pole keeps the shrouds spread, and acts as the first ratline.

Sheers.— Two or more spars that are raised perpendicularly. Their upper ends are lashed together

and supported by guys. To the under part of the lashing a tackle block is hooked and the contrivance employed for lifting masts in and out.

Sheet.— A rope that is used to spread the clews of square sails and head sails. With boom sails, sheets are used to control the boom.

Sheet Anchor.— The anchor that is carried in the waist on board men-of-war.

Sheet Bend.— This bend is made by passing the end of one rope through the bight of another, then around both parts, and finally under its own part.

Sheet Bitts.— Bitts near the mast, to which the topsail sheets are belayed.

Sheil.— The case of a block in which the sheave turns.

Shifting Backstay.— Backstays that are used only as necessity requires. They are always shifted, when a vessel goes about, so that the weather ones are taut and the lee ones slack. Shifting backstays set up with their own permanent tackle, and are nothing more nor less than preventer stays for the topmast, when the vessel is under a press of sail. When not employed they are set up in the after part of the channels of the mast to which they belong.

Shoe.— A piece or pieces of wood upon which the heels of sheers rest, or a piece of wood hollowed out for the fluke of the anchor to rest in.

Shoe Block.— A block having two sheaves, which revolve at right angles to each other, one horizontal, the other perpendicular.

Short Splice.— A certain kind of splice put in a rope that is not intended to render through a block, as this splice, unlike the long splice, makes a bunch where the ropes are joined. It requires less length of rope to make than the long splice, which is sometimes an important consideration.

Shoulder Block.— A block that has a projection on one end to keep it in place.

Shoulder-of-Mutton Sail.— A triangular boat sail.

Shroud Knot.— A knot put in a shroud to rejoin it after it has parted.

Shroud Laid Rope.— A four-strand rope which is laid up right-handed.

Shrouds.— Ropes of hemp or wire that are fitted over the mastheads and extend to the vessel's sides, or to the rim of the tops, where they are set up by dead-eyes or turn-buckles to support the masts sideways.

Side Curtains.— The canvas that extends from the ridge ropes to the rail.

Signal Halyards.— The halyards that reeve through a dasher block on the end of the after gaff, or through the hole in the trucks, or to any other place, and which are used to hoist signals or flags.

Single Block.— A block that contains one sheave.

Single Diamond Knot.— An ornamental knot worked with the strands of a rope and used on man-ropes, etc.

Sister Block.— A length of wood that contains two sheaves, one of which is placed above the other. The outside shell has a score between the two blocks for a seizing.

Skysail.— The sail that is next above the royal. A three-skysail-yard ship carries fore, main, and mizzen skysails.

Skysail Pole.— That part of the royal mast above the shoulder, and terminating at the truck, from which the royal rigging leads.

Skysail Yard.— The yard which is next above the royal yard.

Skyscraper.— When a sail is triangular it is called a skyscraper.

Slab Line.— A line that is used for hauling up the foot of a course.

Slack.— The opposite of taut.

Slack Cloth.— A certain quantity of canvas allowed to be gradually gathered up in sewing on the boltrope of a sail, otherwise the rope, by stretching in consequence of wear, might cause the sail to tear.

Slings.— The chain which connects the center of a yard to the mast. Also a length of rope that has its ends spliced together, called also a strap.

Slip Knot.— A knot that slips along a rope around which it is made.

Slip Rope.— A rope arranged so it may be let go quickly.

Slippery Hatch.— A loop or half-bow knot tied in a rope after passing it around or through something, which will not jamb, and which will untie by pulling the hanging end.

Small Stuff.— A name given to marline, spun yarn, etc.

Smiting Line.— A line which breaks out a yarn-stopped sail.

Snake.— To confine two ropes after the manner of racking or nippering.

Snatch Block.— A block that contains one sheave, and has an opening in the side of the shell so that the bight of a rope may be passed into it. This obviates the necessity of reeving the end.

Snotter.— A rope used to pull off the lift and brace of a light yard when it is being sent down.

Span.— A rope that has both its ends made fast, in the bight or loop of which a purchase is hooked. The span of the rigging is the distance from the dead-eyes or turn buckles on one side of the vessel, up over the eyes of the rigging at the masthead and down to the dead-eyes or turn buckles on the other side.

Spanish Burton.— A kind of purchase.

Spanish Windlass.— A wooden roller that is secured so as to revolve, and which is turned by hitching a marline spike, used as a lever, into the bight of the rope wound around it.

Spanker Mast.— The mast on which the spanker is set.

Spars.— A general name applied to masts, booms, gaffs, and yards.

Spar Varnish.— A varnish of superior quality, that is not affected by salt water, soap, grease, or ammonia fumes, which is used as a coating for spars and all outside or exposed work, or any place where a varnish of extra durable quality is required. It is sometimes called spar composition.

Spectacle Irons.— Sometimes called spectacle shackles. A three-eyed iron on the clews of courses, in which is made fast the tack, etc.

Spider.— An iron crane that is used to keep a block clear of anything.

Spider Band.— The name sometimes given to the band just under the top and to which the futtock shrouds are secured.

Spilling Lines.— Ropes that are temporarily fitted to sails and used to spill the wind out of them.

Spinnaker.— A racing sail shaped like a jib, the open foot of which is extended along a light spar called a spinnaker boom. It is set on the side opposite to the main boom when the vessel is sailing with the wind abaft the beam.

Splice.— To join two ropes together, or to form a loop in the end of a rope.

Spitfire.— A name sometimes given to the storm jib.

Spreaders.— On each bow of very sharp vessels, a horizontal bar is rigged out so as to give more spread to the head sheets, on the same principle that the whiskers spread the jib boom guys.

Spring Stay.— A horizontal stay, which extends from one lower masthead to another lower masthead.

Sprit.— A staff or small spar which extends diagonally from the mast and is used to hoist the peak of small boomless and gaffless sails, which are not provided with peak halyards. The upper end of the sprit rests in a small grommet or becket and the lower end in a snotter, secured to and near the foot of the mast.

Spritsail.— A sail that was formerly suspended under the bowsprit from the spritsail yard. Also a sail that is extended by a sprit. A sprit gaff-topsail is one that has its luff secured to a sprit that extends above the truck, thus lengthening the hoist of the sail.

Spritsail Sheet Knot.— A knot that is made by walling and crowing the six strands of the rope together, thus forming an eye.

Spritsail Topgallant Sail.— An old-time sail which was set on the flying jib boom in the same manner that the spritsail topsail was set on the jib boom.

Spritsail Yard.— A yard which was formerly used instead of whiskers, which was lashed across the bowsprit and used to spread the jib boom guys and flying jib boom guys. There was also a sail bent to it, which was called a spritsail, and which was set under the bowsprit.

Sprit Topsail.— A topsail set flying from the deck with the luff laced to a pole called a sprit; but this sail does not project beyond the gaff end like a club topsail.

Sprung.— Anything that is bent out of shape.

Spun Yarn.— Two or three rope yarns twisted together into a cord.

Spurling Line.— A line that connects the tiller and telltale, and by which the latter is made to point parallel with the tiller for the benefit of the wheelsman.

Square.— Very long yards are said to be square. A sail is called square on the head, when it is long on the head. To square a yard is to brace it so it will be at right angles to the keel.

Square by the Braces.— A yard is square by the braces when the latter are hauled on so that the yard is exactly at right angles to the keel.

Square by the Lifts.— When the lifts are hauled on so as to make the yard perfectly horizontal.

Square Marks.— A winding of twine placed on the lifts and braces, and which, when brought to a certain point, indicate that the yard is horizontal and at right angles to the keel.

Square Rigged.— A vessel that carries yards on all her masts.

Square Sail.— A temporary sail which is set on a yard hung just below the fore crosstrees of a schooner, or sloop, when the wind is abaft the beam.

Square Sterned.—A vessel the stern of which is almost perpendicular and has no overhang.

Staff.— A light flag pole.

Standing— That part of rope or cable that is secured to something is known as the standing part. The part of a hook opposite to the point. The part of a tackle which is secured to a block.

Standing Backstays.— Stays which set up abaft the shrouds on each side, and support the masts when the vessel is under sail.

Standing Bowsprit.— A fixed bowsprit, one that does not run in and out.

Standing Gaff.— Gaffs that are kept throated and peaked aloft, on which fore-and-aft sails are set by means of an outhaul and furled by means of brails. These sails have no booms.

Standing Gaff-Topsail.— The regular working topsail which hoists upon the topmast by hoops. Its foot is spread by the gaff.

Standing Rigging.— Stays, shrouds, etc., which are secured permanently, and not hauled upon.

Starboard.— The right-hand side of a vessel when looking forward.

Starboard Tack.— Having the starboard tack of a square sail on board, i. e., to have the starboard side of the vessel presented to the wind.

Stay.— To stay a mast is to support it sideways, forward, and aft.

Stay Holes.— These are small holes that are worked in the luff of staysails, in which to secure the hanks which fasten the sail to the stay.

Stays.— Ropes of hemp or steel that are used to support masts. The fore-and-aft stays lead forward, and include the fore, fore-topmast, jib, flying jib, jib topsail, inner jib, outer jib, main, main topmast, mid-

dle, main topgallant, main royal, mizzen, mizzen topgallant, mizzen topmast, and mizzen royal stays. Those stays which lead down to the vessel's sides are called backstays.

Staysails.— Are those sails which hoist upon stays. The fore staysail is the first head sail forward of the foremast, the main staysail goes between the fore and main masts, the mizzen staysail goes between the main and mizzen masts. There are also middle, topmast, topgallant, and royal staysails.

Steerage.— The lower deck of a passenger vessel, on which the steerage passengers live.

Steering Bridge.— The bridge on which the steering wheel is placed.

Steering Wheel.— The wheel that is connected with the tiller, and by which the vessel is steered.

Steeve.— A bowsprit steeves in proportion to its angular elevation from the horizontal. A long spar that has a block at one end and is used in stowing some kinds of cargo.

Step.— To step a mast is to fix a lower mast in position. The framing of wood or iron on the main keelson, in which the heel of a lower mast sets, is called a step.

Stern.— The aft part of a ship, that part of the hull which is farthest from the stem or bow.

Stern Davits.— Davits that project from the stern of a vessel and from which a boat is suspended.

Stern Ladder.— A ladder that hangs over a vessel's stern for the use of the gig's crew when that boat hangs from the stern davits.

Stern Port.— A window in the stern of a vessel.

Sticks.— A name sometimes applied to masts.

Stirrups.— Short ropes that have eyes spliced in one end; the other end is seized to the jackstay on the yard. The ends in which are the eyes hang down and support the footropes, which reeve through the eyes.

Stock.— The horizontal cross piece of an anchor, which may be either of wood or iron. It is placed at right angles to the arms.

Stools.— Small channels which are placed abaft the regular channels, and to the dead-eyes or turn buckles of which the backstays set up.

Stop.— A fastening of small stuff that is used to secure a sail to a boom or gaff after it is furled; on a square sail they are called gaskets.

Stopper.— A short length of rope, one end of which is secured convenient to a running rope or cable, and used to check or regulate the motion of the latter by winding the stopper around it. There are various names applied to the stoppers according to their use, viz., deck, lanyard, dog, bitt, hatch, wing, ring, slip, lever, etc.

Stopper Bolts.— Ring bolts in the deck to which the stoppers are fastened.

Stopper Knot.— A double wall knot in the end of a deck stopper.

Storm Canvas.— Small sails of heavy material, which are used during storms in place of the regular working sails.

Storm Jib.— A small jib of heavy canvas that is used in bad weather.

Stow.— To fix anything in place.

Strand.— One of any number of rope yarns twisted together to form a rope or cable. A rope is stranded when one of the strands forming it is broken.

Strap.— A length of rope, the ends of which are spliced together so as to form a ring; and used for various purposes, such as for slinging bales, for attaching a tackle to any object, etc.

Strengthening Pieces.— Extra pieces of canvas, which are sewed on the corners of sails, also at the reef cringle and along the luff.

Strop or Strap.— A binding of rope which encircles and is fitted into the score of a block, in one part of which an eye is formed by seizing a thimble in the drift, or spare part. Some blocks are iron-bound.

Studding Sails (pronounced stun'sails).— Light auxiliary sails carried in moderate weather when there is a fair wind, and which are set outside of the square sails on booms rigged out through rings on the yards. There are lower, topmast, topgallant, and royal studding sails.

Studding-Sail Boom.— The horizontal bar on which the studding sail sets.

Studding-Sail Brace.— The rope which leads from the outboard end of the studding-sail boom to the side of the vessel.

Studding-Sail Halyards.— The ropes with which the studding sails are hoisted to the studding-sail booms. There are two sets, which are named respectively inner and outer studding-sail halyards.

Studding-Sail Halyard Bend.— The bend which secures the studding-sail halyards to the studding-sail yard.

Studding-Sail Outhaul.— The tack line of the lower studding sail, which leads through a block on the end of the swinging boom.

Studding-Sail Sheet.— The line which secures the inner lower corner of a studding sail.

Studding-Sail Tack.— The rope secured to the outer lower corner of a studding sail.

Studding-Sail Yard.— The light spar to which the head of the studding sail is lashed before the sail is sent up or aloft.

Swallow.— The space or opening in a block which takes the rope before it passes over the sheave.

Swifters.— The forward shrouds of a lower mast on the port and starboard sides. There are fore, main, and mizzen swifters. The lengths of rope employed to keep the capstan bars in place are also called swifters.

Swivel.— A metal link that turns upon an axis. It is used on cables to keep turns or twists out of them. It is also used on iron-bound blocks.

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Tabling.— The hem on the borders of sails, to which the boltrope is sewed.

Tack.— The tackle by which the clew of a course is hauled forward and down; the tack line or tack pennant of a fore-and-aft or gaff-topsail is the rope that keeps down the tack of the sail. The lower forward corner is called the tack of a sail. The rope that keeps down the lower outer corner of a studding sail is also called the tack.

Tack Cringle.— The iron ring that is spliced into a fore-and-aft sail at the junction of the luff and foot. Also the iron shapes spliced into the lower corners of square sails.

Tack Earing.— The length of rope that is passed through the tack cringles on a fore-and-aft sail, and used to keep the slack luff of the sail down to the boom after it has been reefed.

Tack Tricing Line.— The line by which the tack of loose-footed fore-and-aft sails is triced up.

Tackle.— A purchase of ropes and blocks.

Tail.— A tail block has a short length of rope hanging from the splicing around the block, which

takes the place of a hook. A vessel at anchor tails up or down stream according to the way her stern is turned.

Tail Tackle.— A watch tackle purchase, which has a tail to one of the blocks.

Tank.— An iron receptacle for containing fresh water.

Tank Toggle.— A short heavy piece of wood which is placed inside of a tank, across the manhole, and to which a strap is fixed and a block hooked, when it is desired to lift the tank.

Tanned Sails.— Sails that have been soaked in an oak bark solution to keep them from mildewing.

Tar.— The gum of pine trees. It is used on standing rigging to protect it from the elements.

Tarpaulin.— Painted canvas which is used as a covering for hatches, etc.

Taunt.— Tall or high masts are sometimes spoken of as taunt masts. A vessel is said to be all-a-taunt-o, when she has all her masts and yards aloft, sails bent, and rigging in order.

Taut.— Tight.

Telegraph Block.— This is a block with a long narrow shell, in which are a number of small sheaves. It is used in making signals.

Telltale.— An inverted dry card compass, hung from one of the beams below deck, so that the direction the vessel is headed may be known at any time without going on deck.

Tenon.— The shoulder on the heel of a mast which fits into the step or mortise in the main keelson.

Thick and Thin Block.— A block that has two sheaves, one thicker than the other, so as to accommodate different sizes of rope passing over them.

Thimble.— An iron ring with a groove around its outer rim for a rope to fit into, so that it may be held in place when it is spliced, either in the corner of a sail as a cringle or in the end of the pendant. A thimble prevents chafing.

Three-Fold Block.— A block that contains three sheaves.

Three-Fold Purchase.— A purchase which is made of two blocks, each containing three sheaves.

Throat.— The inner end of a gaff, where the throat block is hooked. Also that corner of a fore-

and-aft sail which is adjacent to the junction of the gaff and the mast.

Throat Bolt.— The metal eye-bolt in the throat of the gaff, to which the lower throat halyard block is hooked.

Throat Brail.— The rope which gathers a brailing sail up and into the throat of the gaff.

Throat Halyards.— The halyards which hoist the inner end of the gaff, and the luff of a fore-and-aft sail, or that part of the sail which is against the mast.

Throat Seizing.— A seizing which secures the end of a shroud or stay around a dead-eye, by making the end fast to its own standing part after it has been fitted around the score.

Thrum.— To sew the bight of thrums to a piece of canvas, the same being used to protect the sails and rigging from chafe.

Thrums.— Short strands of rope which are obtained by cutting old gear into pieces several inches in length, then unlaying the strands.

Thumb Cleat.— A small cleat on a yardarm to prevent the turns of the reef earing from slipping along

the yard. Also the little metal crook on the martingale under which the stays lead and are held in place.

Tie.— The single rope which is bent or fastened to a topsail yard in hoisting the spar, and which passes either through the sheave hole in the mast or through a tie-block at the topmast head.

Tiller.— The bar of iron or wood which fits into the forward side of the rudder head, and by turning which the rudder is moved around at different angles to the keel.

Tiller Head.— That end of the tiller which is farthest from the rudder.

Tiller Ropes.— Ropes or chains which lead from the tiller to the barrel of the steering wheel.

Tiller Telltale.— A small arrow on the top of the tiller box, connected with the barrel of the wheel, and which indicates the position of the tiller by its angle with the keel of the vessel.

Timber Heads.— The ends of timbers which project above the deck, and are used for belaying hawsers, etc.

Timber Hitch.— This hitch is made by passing the end of a rope around a spar or timber head, then

leading it up under and over the standing part, and passing a couple of turns around its own part.

Timber Port.— A small port in the bows of vessels which carry timber and used to run the cargo out and in horizontally.

Timenoguy.— A rope stretched from one point to another for the purpose of preventing gear from fouling, especially from the stock of the waist anchor to the fore rigging to prevent tacks and sheets fouling with the stock.

Toggle.— A pin of wood or metal employed to connect two ropes. The pin slips through between the ropes, under a loop in one rope and across an eye called a becket, formed in the other rope. Bowlines are fastened to their bridles in this manner, and the method is also employed to secure ring-buoys so that they may be let go quickly in the case of a man going overboard.

Tongue.— The block of wood that is fixed between the jaws of a gaff, and which slides that spar up and down the mast when the throat halyards are handed. This tongue works on a pin which is driven through the jaws of the gaff from side to side, so that it can play fore-and-aft from the perpendicular to accommodate the angle assumed by the gaff when being raised.

Top.— The platform at the head of a lower mast which rests upon the trestletrees, which in turn rest upon the hounds of the mast. The top is used to give spread to the topmast rigging, and to the rim of the structure the rigging is set up to dead-eyes or turn-buckles. To top a boom or yard is to elevate one end of it by the peak halyards and lift respectively.

Top Block.— This is a large iron-bound block through which the top-rope reeves when sending up or down topmasts.

Topgallant Mast.— The mast next above the topmast.

Topgallant Rigging.— The shrouds and their ratlines which belong to the topgallant masts.

Topgallant Sail.— The third sail above the deck on an old-time man-of-war, or where single topsails are carried; but the sail which is next above the upper topsail on a vessel carrying double topsails. Some large merchant vessels divide the topgallant sail in the same manner as the topsail, and therefore have double topgallant sails named in the same way as the topsails, upper and lower.

Topgallant Shrouds.— The shrouds which are on the topgallant masts.

Top-Heavy.— When the upper part is too heavy for the lower part, it is top-heavy.

Top Hamper.— All the spars, rigging, etc., which are above the deck.

Top Lining.— An extra piece of canvas that is sewed on the after surface of a square sail to take the chafe of the top rim.

Topmast.— The second mast above the deck, or the mast which is next above the lower mast. They are named according to their location as fore, main, and mizzen topmasts.

Topmast Rigging.— The shrouds and their ratlines which belong to the topmasts.

Topmast Shrouds.— The shrouds on the topmasts.

Topsail.— The second sail above the deck. Merchantmen carry double topsails, as they are much easier to handle with a limited crew. A ship carries fore, main, and mizzen topsails. The topsails are named respectively upper and lower topsails.

Topsail Halyard Bend.— This is made by making two turns around the spar, then leading the end back around the standing part and under all the turns, then bringing it around its own part and back

again over the two other turns and under the inner turn.

Topsail Schooner.— A vessel that carries a square topsail on the fore topmast, the mainmast being provided with a fore-and-aft mainsail and a gaff-topsail.

Topsides.— The sides of a vessel from the water line to the bulwark rail.

Topping.— Raising one end of a spar higher than the other. To top the boom, etc.

Topping Lift.— A purchase for topping a boom and sustaining the weight of the after end of the same.

Traveler.— An encircling iron ring which slides along a deck horse or up and down a rope.

Traverse.— To traverse a yard is to brace it in a fore-and-aft direction.

Traverse Board.— An old-fashioned instrument for recording the course or several courses made by a vessel during a watch. It was a round board with the points, half-points, and quarter-points of the compass painted upon its rim. In each one of such subdivisions of the rim eight gimlet holes were

bored, and into one of these, corresponding to the vessel's course, a peg was placed every half hour.

Treble Block.— A block which has three sheaves. It is the same as a three-fold block.

Treenails.— Wooden pins which are used to fasten a plank to a timber.

Trestletree.— The two pieces of fore-and-aft horizontal timber which rest on the hounds of the mast, and which support the crosstrees, and across which the fid of the mast above rests.

Triatic Stay.— A wire or hemp rope which is secured to the head of a topmast of a fore-and-aft vessel, and leads thence to the lower masthead of the mast next abaft, and acts as a support to the topmast.

Trice.— To haul anything up, as the heel of a studding-sail boom, etc.

Tricing Line.— A line with which anything is triced up.

Trip.— To trip a yard is to swing it from the horizontal to the perpendicular.

Tripping Line.— A line that is used in tripping a yard. Also the line by which a drag or sea anchor is capsized.

Truck.— A circular-shaped piece of wood which is placed at the extremity of the highest mast, and has small holes or sheaves in it for the signal halyards to reeve through.

Trunk Cabin.— The name given to a cabin which is half above and half below the upper deck.

Truss.— An iron fixture which holds the center of a lower yard to the mast.

Trysail Gaff.— A gaff to which the head of a trysail is bent.

Trysails.— These are fore-and-aft gaff-sails, which are carried on the fore and main masts of a ship, and hoist on small masts called trysail masts, abaft the lower mast. These sails are also called spencers, while the fore-and-aft sail carried at the mizzen-mast of a ship or bark is called a spanker. But all these sails are referred to as trysails when set during gales of wind, in order to lay the vessel to or to head-reach under them.

Turk's-Head Knot.— A fancy knot made in the upper ends of manropes, etc.

Turn.— To pass a rope or chain around a pin or bitts as a fastening for the former is known as catching or taking a turn. To turn in a dead-eye, is

to strop it with the end of a shroud. Turn the glass, is to turn the sand glass over when heaving the log.

Turn-Buckle.— A simple mechanical device consisting of a thread and screw, which is kept permanently on standing rigging for setting it up.

Twice-Laid Rope.— Rope that has been laid up from old yarns.

Two-Fold Block.— A block which has two sheaves.

Two-Fold Purchase.— A purchase which has two double blocks.

Two Half Hitches.— Often used as a mooring hitch. It is made by passing the end of a rope around the standing part and bringing it up through its own bight, and then repeating the latter part.

Two Topsail Schooner.— A vessel which carries a square topsail on the fore topmast and also on the main topmast.

Tye (see Tie).

Tyers.— Short lengths of rope which are used for tying up a sail. They take the place of gaskets.

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Under Foot.— When the anchor is directly below the hawse pipe, it is under foot.

Undermasted.— When the masts are either too short or too slender for the vessel, it is undermasted.

Unfurl.— To cast loose a sail, to throw the gaskets off a sail.

Unreeve.— To draw a rope out of a block.

Up and Down.— Anything that is in a perpendicular position, as the yards are up and down the rigging.

Upper Topgallant Sail (see Topgallant Sail).

Upper Topsail (see Topsail).

Upper Works.— The sides of the vessel from the water line to the covering board.

V

Vane.— A fly carried at the truck, made of bunting, which traverses on a spindle and shows the direction of the wind.

Vangs.— Ropes for steadying a gaff, which are secured to the outer end of the spar and lead to the rail on each side.

Vessel.— A general term that is applied to all classes of square and fore-and-aft rigged vehicles of navigation.

Viol.— A large messenger, which was once used in weighing anchor by the capstan.

Viol Block.— A large single block that is used with a viol.

W

Waist.— That part of the deck which lies between the forecastle and quarter-deck.

Wall Knot.— A knot worked in the end of a rope by crossing and looping the strands.

Washboards.— Lengths of thin plank, which are fastened to and project above the gunwales of boats and small low-sided vessels to keep the spray out and increase the freeboard. They are also called wash strakes.

Watch Tackle.— A purchase that is formed of a double and single block. The single block is pro-

vided with a hook and the double block with a tail. Also called a " jigger " and " handy billy."

Water Laid Rope.— A name that is sometimes applied to rope that is laid up left-handed.

Water Sail, also called Save-all.— A kind of studding sail, which is set under the swinging boom. It is seldom used.

Wedding Knot.— A crossed seizing that is placed between two eyes.

Wedge Fid.— A two-part wedge-shaped fid.

Well.— A cockpit. The boxed-in space which encloses the pumps of a vessel.

Wheel.— The instrument that is used to steer a vessel. It is connected with a barrel around which the tiller ropes wind.

Wheel Chains.— Chains used in place of ropes to connect the steering wheel with the tiller.

Wheelhouse.— The house on deck which contains the wheel, which in turn is connected with the tiller, and by which the vessel is steered.

Wheel Rods.— Lengths of straight rod along the waterways, that take the place of a part of the wheel rope or chain.

Wheel Rope.— The rope which connects the steering wheel with the tiller.

Whelps.— Pieces of iron which are bolted to wooden windlass barrels to prevent the chain cable from cutting into the wood.

Whip.— A purchase formed of one single block with a small rope rove through it. To prevent the end of a rope from fagging by seizing it around with twine. A double whip has two single blocks.

Whip and Runner.— A whip, the block of which is spliced into a pendant. One end of the whip is made fast, the bight rove through the pendant block, and the other end is the hauling part.

Whip Upon Whip.— One whip applied to the fall of another.

Whipping.— The binding of twine that is placed around the end of a rope to keep it from fraying.

Whiskers.— Spars or irons that project from the bowsprit, for the purpose of giving more spread to the jib boom guys.

White Lead Putty.— A putty made of white lead and whiting, and used to fill deck seams on yachts.

Winch.— A horizontal barrel that is turned by a crank. A mast winch is on the deck just in front of the mast, and is used to hoist yards and gaffs when making sail.

Wind Sail.— A long funnel-shaped canvas, which leads below through one of the hatches. It is kept spread by wooden hoops, and is used to send fresh air below decks. An opening in its upper part, or head, admits the air, which is gathered by two large canvas flaps, or ears, standing out on each side, and trimmed by bowlines. The wind sail hoists by halyards, and is slued around as often as necessary to face the wind.

Windlass.— The machine by which an anchor is hoisted.

Windlass Bitts.— The upright supports for the barrel of the windlass. These uprights are also called carrick-heads, carrick-bitts, and windlass-heads.

Windlass Capstan.— A combination of a windlass and a capstan, in which the windlass moves the spindle of the capstan by means of gearing.

Wing.— That part of the hold which is next the side.

Wire Rigging.— Standing rigging of wire rope, which has almost entirely taken the place of hemp standing rigging.

With the Sun.— A rope which is laid up from right to left is said to be laid up with the sun.

Woodlock.— A block of wood that is bolted to the rudderstock under one of the pintles, so as to prevent the rudder from unshipping.

Woolding.— The winding of rope around a spar after it has been fished.

Working Jib.— The regular jib, one of the head sails.

Working sails.— All the regular sails of a vessel, except such as are rigged specially in light breezes. Under the latter head would be studding sails for a ship, and club topsails and balloon sails for fore-and-aft vessels.

Working Topsail.— Known also as the standing and the gaff-topsail, as distinct from the sprit or club topsails, which are hoisted from the deck and set flying.

Working Up.— To make spun yarn, etc., out of the strands of old rigging.

Worm.— Filling up the lays of a rope with spiral windings of small stuff.

Wring.— To strain unduly. To wring a mast is to buckle it by setting the shrouds up too tight.

Wythe.— An iron ring fitted to the end of a boom, as a cap, through which a spar is rigged out. It is also called a boom iron.

Y

Yacht.— A vessel used for pleasure, or for racing.

Yard.— A spar that is suspended horizontally to the forward side of a mast, and to which the head of a square sail is bent. Yards also spread the foot of the sail next above. They are hoisted by halyards, turned by braces, and supported by lifts. The middle of the yard is called the slings, the ends of the yard the yardarms, and that part between the slings and yardarms the quarters. Lower yards are hung in a truss, and upper yards confined to the mast by parrals. There are lower yards, topsail yards, topgallant yards, royal yards, and skysail yards.

Yard A-Box.— A yard is a-box when its sail is aback.

Yardarm (see Arm).

Yard Rope.— A rope that is used in sending up and down yards.

Yard Tackle.— A heavy tackle that is hooked into a strop on lower yards, and used for hoisting heavy weights.

Yoke.— A horizontal piece of wood or metal, which is placed across the head of a boat's rudder, to each end of which a yoke line is secured, and by which the boat is steered.

Yoke Lines.— Short pieces of rope that are fastened to the yoke, and by pulling which the rudder is turned.

METHODS OF MASTING

The English method of sparring ships is as follows: Let L represent the length of the ship between the stem and sternpost on the deck, and B the breadth to the outside of the wales; the whole length of the mainmast will be $\frac{L+B}{2}$, its diameter seven-eighths (7/8) of an inch for each three (3) feet of length of the mast; foremast, eight-ninths (8/9) of the mainmast; mizzen, three-fourths (3/4) of the main, diameter two-thirds (2/3) of the mainmast; main topmast, three-fifths (3/5) of the mainmast, diameter one (1) inch per three feet; fore topmast eight-ninths (8/9) of the main topmast; mizzen topmast, five-sevenths (5/7), diameter seven-tenths (7/10) of the main topmast; topgallant mast, one-half (1/2) of the topmast, diameter one (1) inch per three (3) feet; royal masts, three-fourths (3/4) of the topgallant masts, diameter two-thirds (2/3) of the topgallant masts; whole length of bowsprit, three-sevenths (3/7) of the main mast; outboard, three-fourths (3/4) of this length, diameter same as that of the foremast; jib boom outside of the cap of the same, as the bowsprit outboard, diameter one (1) inch for two and one-half (2 1/2) feet of length;

flying jib boom, five-sevenths (5/7) of the jib boom, diameter seven-eighths (⅞) of an inch for three (3) feet of length; main yard, seven-eighths (⅞) of the mainmast, diameter seven-tenths (7/10) of an inch per three (3) feet; fore yard, seven-eighths (⅞) of the main yard; mizzen, or crossjack yard, same as the fore topsail yard, diameter five-eighths (⅝) of an inch per three (3) feet; main topsail yard, five-sevenths (5/7) of the main yard, diameter five-eighths (⅝) of an inch per three (3) feet; fore topsail yard, seven-eighths (⅞) of the main topsail yard; mizzen topsail yard, two-thirds (2/3) of the main topsail yard; topgallant yard, three-fifths (3/5) of the topsail yard; royal yards, one-half (½) of the topsail yards; mizzen boom, the same as the main topsail yard; gaff, five-eighths (⅝) of the boom, diameter five-eighths (⅝) of an inch per three (3) feet of length.

The rule in the United States for masting ships is doubtless the most variable on the globe. Of the most prominent builders in the past, each one has professed to have a method peculiar to himself. Some tangible results have been gained from several of the best proportioned, double-decked freighting ships; not, however, as to the mode of adapting the stations and dimensions to the peculiarities of the model, for this would be admitting that ships are thus sparred, which is not done. The idea that any system of sparring ships or other vessels is adopted in this more than in any other country, cannot be

entertained. All the changes that have been made from the common rules, or well-known usages, have been made in accordance with the opinions of the builders, without reference to the lateral resistance, the very basis of propulsion by sails. But while American shipbuilders have varied from the rules of a stereotyped age, there is good reason for the belief that they will yet recognize a system worthy of themselves, of the age, and of the country in which they live. The following is the result of the deductions referred to: Let the load line from the aft side of the stem to the fore side of the sternpost be divided into seven hundred and sixty (760) parts; of these, take one hundred and fifty (150) parts from the stem to the center of the foremast; thence to the center of the mainmast, two hundred and sixty-four (264) parts; thence to the center of the mizzenmast, two hundred and eleven (211) parts; and one hundred and thirty-five (135) parts will remain. Eleven-twentieths (11/20) of the length of the load line should be the length of the mainmast; foremast, eighteen-nineteenths (18/19) of the mainmast; mizzenmast, seventeen-nineteenths (17/19) of the mainmast; main topmast, ten-nineteenths (10/19) of the mainmast; main topgallant mast, twelve-twentieths (12/20) of the main top-mast; royal, fourteen-twentieths (14/20) of the topgallant; skysail mast, ten-fourteenths (10/14) of the royal; main yard, seven-eighths (7/8) of the length of the mainmast; main topsail yard, fourteen-seventeenths (14/17) of

the lower yard; main topgallant yard, thirty-seven forty-ninths (37/49) of the topsail yard; main royal, twenty-eight thirty-sevenths (28/37) of the topgallant; main skysail, twenty twenty-eighths (20/28) of the royal. The fore topmast, topgallant, and royal should bear the same ratio to the lower masts that the main does; likewise the mizzen topmast, etc. The fore yard, topsail yard, topgallant, and royal will have the same ratio as the main; the mizzen likewise will be so related; as a consequence the fore yard will be eighteen-nineteenths (18/19) of the main yard; and the fore topsail yard, fourteen-seventeenths (14/17) of the lower yard; the topgallant, thirty-seven forty-ninths (37/49) of the topsail yard; etc.; the crossjack yard, seventeen-nineteenths (17/19) of the main yard; mizzen topsail yard, fourteen-seventeenths (14/17) of the crossjack yard; bowsprit outboard, one-third (⅓) of the foremast; jib boom, eighteen twenty-fourths (18/24) of the outboard part of the bowsprit; spanker boom, one-half (½) the length of the foremast; gaff, twenty-five thirty-sixths (25/36) of the length of the boom. This rule will also apply to brigs.

The methods of masting schooners are so variable that little tangible information can be secured; the hoist of sails ranging from twice to two and two-thirds (2⅔) times the breadth of the beam. The masts are sometimes stationed in the following order: Divide the length of the deck into seven hundred and fifty-six (756) parts; take one hundred and

ninety-two (192) parts from forward to the center of the foremast; two hundred and fifty-eight (258) parts from the center of the foremast to that of the main; three hundred and thirty-six (336) parts for the foot leach of the foresail; four hundred and eight (408) parts for the foot leach of the mainsail; one-half of the latter for the head leach of both sails; and three hundred and forty-eight (348) parts for the foot leach of the jib. These proportions apply principally to fast-sailing coasting vessels, but flat wide schooners with center boards have a greater proportion of sail; there is no rule that is invariable. The schooners of the United States are not built as the English ships are, principally in large cities; but are built wherever timber and capital are found and there is water enough to launch them; hence the diversity in dimensions and shape and distribution of sail.

For sloops, the spars are less variable. In general the hoist of the mainsail is two and one-half (2½) times the breadth; foot leach, three (3) times the breadth added to the depth; after leach, three (3) breadths added to three (3) depths of hold; jib stay, the same as the foot leach of the mainsail; after leach of the jib, the same as the hoist of the mainsail; head of the mainsail, the breadth added to three (3) times the depth; the foot leach of the jib, the same; station of the mast, three-fourths (¾) of the breadth from the forward part of the deck; rake, one-half (½) inch to the foot, that of schooners

being usually from five-eighths (⅝) to seven-eighths (⅞) of an inch.

With regard to the rake of the masts, an almost universal error seems to have prevailed. The original design, in raking masts, was to get lifting power. In vessels with fore-and-aft sails, both masts are raked as if both ends could be lifted by the power of the wind at the same time. It must be evident that if the vessel displaces a volume of water equal in weight to the weight of the vessel, that if the bow is depressed by the power of the wind, the center of propulsion is too high or too far forward. It follows, then, that whatever power is expended in an effort to lift the vessel is lost as a propelling power; and if the vessel's head is depressed, it is not because the masts do not rake enough, but because the altitude of the center of propulsion is above a just proportion of this lifting tendency, consequent upon the rake. Were this what it is assumed to be, the proper method would be to rake the foremast only. However, it should be remembered that any very considerable rake to a vessel's masts has a tendency to depress the vessel when an inclination takes place. The lifting power, therefore, operates adversely when the vessel is careened to any very considerable extent.

EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED IN THE FOLLOWING TABLES

C	Clump block
D	Double block
DE	Dead-eye
F	Fiddle
H	Heart
•	Hook and thimble
I B S	Iron-bound single block
I B S C	Iron-bound single clump block
I B D	Iron-bound double block
Pl. DE	Plates with dead-eyes
S	Single block
S C	Single clump block
Sis	Sister block
St. bd	Strap-bound block
T	Thimble
Tr	Treble block
Trav	Traveler

THE SIZE OF STANDING AND RUNNING RIGGING OF MERCHANT SHIPS

NAMES OF RIGGING	Ship of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Bowsprit Gear				
Gammoning (chain for all classes of vessels)	1			
Shrouds (chain)	1⅛	H	10	4
Lanyards for shrouds (four-stranded)	3			
Bobstays (chains)	1	H	12	3
Lanyards for bobstays	4			
Manropes	4	T		4
Jib Boom Gear				
Jib stay and strapping	5½	C	11	1
Guys (single)	5			
Falls	3	D	9	4
Footropes	3			
Martingale stay	7			
Martingale back ropes	4½			
Martingale falls	2½	D 8*	8 8	2 2
Halyards	3½	8	10	1
Downhaul	2½	8	8	1
Sheets	3	8	9	2
Pendants	4½			
Flying Jib Boom Gear				
Flying jib stay	3½			
Guys	3			
Stay tackle falls	2	8 *	7	2 1
Footropes	2½			

NAMES OF RIGGING	Size of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Flying Jib Boom Gear (*Cont'd*)				
Martingale stay	4			
Halyards and strapping	2½	S	8	1
Downhaul and strapping	2	S	7	1
Sheets	2½			
Heel lashing	1½			
Fore and Main Masts				
Pendants	10	T		2
Shrouds	10	D E	16	14
Lanyards for shrouds	5			
Stays	15	T		2
Collars for stays	8	T		2
Runners of tackles (double blocks, upper lashed to pendants)				
Falls of tackles	4	D	13	4
Ratlines	1½			
Fore and Main Yards				
Slings proper (to go over cap), chain for all vessels				
Jackstay (bending) iron				
Footropes	4½	T		2
Stirrups	3	T		6
Lifts	4	S	13	2
Braces	4	S	16	4
Earings (four in number)	2			
Tacks (tapered) or chain	5	C	10	4
Sheets (tapered)	5	C	10	2
Clew garnets	3½	St. bd.	11	2
Bowlines and bridles	4	S T	12	2 4
Buntlines and falls	3	D S	10 10	4 8
Leach lines	2½	S	8	4
Slab line and strapping	2	S	7	1
Jigger falls and strapping	2½	D* S*	8 8	2 2
Fore staysail stay	6	C	12	1
Halyards	3	S	9	2

NAMES OF RIGGING	Ship of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Fore and Main Yards (*Cont'd*)				
Sheets	3	D*	10	2
		S*	10	2
Tack lashing	2			
Downhaul	2½	S	8	1
Lower studding sail—				
Halyards	3	S	9	2
Inner halyards	3	S	9	4
Span for outer halyard	3½	S	9	2
Lower studding sail—				
Sheets	3			
Tack	3	S	9	2
Tripping line	2	S	6	2
Strapping and tailing	3½			
Swinging boom guys	3			
Fore and Main Topmasts				
Shrouds	6	D E	9	8
Lanyards for shrouds	3			
Ratlines	1			
Standing backstays	7	D E	10	6
Lanyards for backstays	3½			
Burton pendants	4½	T		2
Falls and strapping	2½	D*	9	2
		S*	9	2
Stays	7	T		2
Lanyards	3			
Futtock shrouds	6	Pl. D E	9	8
Lashings	1½			
Ratlines	1			
Staysail halyards	3	S	9	1
Downhaul	2½	S	8	1
Strapping	2½			
Pendants	4½	S	11	2
Sheets	3½			
Tack lashing	¾			
Fore and Main Topsail Yards				
Topsail ties (all chain)		I B S	17	1
Halyards for topsail ties	3	D	13	2
		S*	13	2

NAMES OF RIGGING	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Fore and Main Topsail Yards (*Cont'd*)				
Strapping bullock blocks	5	S	17	2
Jackstays (iron)				
Footropes	3½			
Stirrups	2	T		2
Flemish horses	2½			
Braces	3	S S	10 9	4 2
Lifts	3½	Sis.	14	2
Parral rope	4			
Clew lines and strapping	3½	St. bd.	11	2
Buntlines and strapping	3	S	9	2
Span	3	T		2
Bowlines and strapping	3	S	9	2
Reef tackles and strapping	3	S T	9 ..	2 2
Sheets (all chain)				
Studding-sail halyards	3½	S	11	4
Sheets	3½			
Tacks	3½	S	11	4
Downhaul	2	S	6	2
Boom jiggers	2	D S	7 7	2 2
Heel lashing	3			
Boom brace pendant	3½	S	6	2
Whip	2			
Fore and Main Topgallant Masts				
Shrouds	4	T		8
Lanyards for shrouds	2			
Backstays	4½	D E	6	4
Lanyards	2			
Stay	4			
Tackle fall and strapping	2½	D S*	7 7	1 1
Royal stay	2½			
Backstays	2½	T		4
Lanyards	1			

NAMES OF RIGGING	Ship of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Fore and Main Topgallant Yards				
Halyards and strapping	3½	D S*	11 11	1 1
Jackstay (iron)				
Footropes	2½			
Braces and strapping	2¼	S	6	6
Lifts	3	T		2
Parral ropes	2			
Clew lines	2	S	6	2
Straps for quarter blocks	2	D	6	2
Bowlines and strapping	2	S	6	2
Bridles	2	T		2
Sheets	3½			
Earings	1			
Studding-sail halyards	2½	S	7	4
Sheets	2			
Tacks and strapping	2	S	6	2
Downhaul and strapping	1½	S	5	2
Fore and Main Royal Yards				
Halyards	2½			
Jackstay (iron)				
Footropes	1			
Braces and strapping	2	S	5	2
Lifts	2	T		2
Parral lashing	1			
Clew lines and strapping	1	S	4	2
Bowlines	1	T		2
Sheets	2½			
Earings	½			
Mizzenmast				
Shrouds	6½	D E	9	12
Lanyards for shrouds	3			
Burton pendants	4½	T		2
Falls and strapping	3	D* S*	10 10	2 2
Ratlines	1¼			
Stay	7½	T		1

NAMES OF RIGGING	Ship of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Mizzenmast (*Cont'd*)				
Seizings	1½			
	¾			
Lanyards	3			
Crossjack Yard				
Slings (chain for all vessels)				
Trusses (iron)				
Footropes	3			
Stirrups	2½	T		2
Lifts	2½			
Braces and strapping	2½	S	8	4
Mizzen Topmast				
Shrouds	5	D E	8	8
Lanyards and shrouds	2½			
Stay	5			
Ratlines	1			
Backstays	4½	D E	8	4
Lanyards	2½			
Futtock shrouds	4½	Pl. D E	8	8
Mizzen Topsail Yard				
Topsail ties (chain)		I B S	12	1
Halyards for tie and strapping	2½	D	8	1
		S*	8	1
Jackstay (iron)				
Footropes	2			
Stirrups	2½	T		2
Flemish horses	2			
Parral rope	3			
Lifts	3	Sis.	8	2
Braces	2½	S	8	4
Sheets (chain)				
Clew lines and strapping	2	St. bd	7	2
Buntlines and strapping	2	S	7	2
Span	2	T		2
Bowlines and strapping	2	S	7	2
Bridles	2	T		2
Reef tackles	2½			

NAMES OF RIGGING	Ships of 1100 Tons			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
Mizzen Topsail Yard (*Cont'd*)				
Earings	1½			
Mizzen Topgallant Mast				
Shrouds	3	T		8
Lanyards	1½			
Backstays	3	T		2
Lanyards	1½			
Stay	3			
Lanyard	1½	T		1
Royal stay	2			
Backstays	2	T		2
Lanyards	1			
Mizzen Topgallant Yard				
Jackstays (iron)				
Footropes	1½			
Parral lashing	1½			
Lifts	2	T		2
Halyards and strapping	2½	S*	6	2
Sheets	2			
Clew lines	1½			
Bowlines and strapping	1½	S	5	2
Bridles	1½	T		2
Earings	½			
Strapping, quarter blocks	2	D	4	2
Mizzen Royal Yard				
Jackstays (iron)				
Footropes	1			
Braces and strapping	1	S	4	2
Parral lashing	½			
Lifts	1½	T		2
Halyards	2			
Clew lines and strapping	1	S	4	2
Earings (marline)				
Sheets	1			

NAMES OF RIGGING	SHIP OF 1100 TONS			
	Size of Rope in Inches	Blocks, etc.		
		Description	Size in Inches	Number
SPANKER BOOM				
Topping lifts	4½	S	13	2
Falls and strapping	3	D	9	2
		S*	9	2
Boom sheet	3½	D	11	2
Outhaul	3½	C	7	1
Guy pendants	3½	.....	.....	.....
Falls and strapping	2½	D	8	2
		S*	8	2
GAFF				
Throat halyards	4	D	12	1
		T	..	1
Peak halyards and strapping	4	I B D	12	1
		S	12	2
Vang pendants	3½	.....	.....	.....
Falls and strapping	2	D	7	2
		S*	7	2
Peak brails	2	S	7	2
Throat brails	2½	Tr.	8	2
Middle brails	2	D	7	2
Hook brails	2	S	7	2

TABLE OF RIGGING FOR SCHOONERS OF 180 TO 200 TONS

NAMES OF RIGGING	Ropes or Chains, Size in Inches	Description of Blocks, etc.	Number	Inches	Hooks	Thimbles
BOWSPRIT						
Gammoning (iron clamp)						
Shrouds (chain)	1/4					
Bobstays (chain)	1/4					
JIB BOOM						
Jib stay	5					
Purchase	2 1/2	I B D	2	7		
Guys	5	S C	2	7		
Runners	3 1/4				2	2
Falls	2 1/2	I B S	2	7		
		F	2	12		
Martingale stay (chain)	1/2					
Back ropes	4 1/2	D	2	7		
		I B S	2	7		
Falls	2 1/4					
Footropes	2 1/2					
Heel rope	3 1/4	I B S	1	9		
Jib halyards	2 1/4	S	2	8		
Tack (traveler)	3 1/4					
Downhaul	2 1/4	S	1	6		
Outhaul	2 1/4	S	1	9	1	1
Sheet pendants	4 1/2	S	2	8		1
Sheets	2 1/4				2	2
Jib topsail halyards (square-sail halyards always used)						
Tack	1 1/4					
Sheets	2 1/4					
FOREMAST						
Shrouds and pendants	6 1/4	D E	6	8		
		S C	2	8		

NAMES OF RIGGING	Ropes or Chains, Size in Inches	Description of Blocks, etc.	Number	Inches	Hooks	Thimbles
FOREMAST (*Cont'd*)						
Ratlines	9 thr.					
Runners of tackles	4½				2	2
Falls	2½	D	2	8		
		I B S	2	8		
Forestay	9					
Lanyard	2½					
Storm stay	4½					
Lanyard	2					
Lacing	2½					
Halyard	2¾	I B S	2	9		
Tack	3½				1	1
Fall	2¼	I B D	1	7	1	1
		I B S	1	7	..	..
Downhaul	2¼	S	1	7		
Sheets	2¾	D	2	9		
		I B D	2	9		
FORE YARD						
Square sail halyards	2¾	I B D	2	8		
Braces	2¼	I B S	2	6	4	
Lifts	2¼					
Yard ropes	3½	D	2	9		
TOPSAIL YARD						
Square topsail sheets	2½	D	1	7		
Halyards	3					
FORE TOPMAST						
Shrouds	3¼					
Stay	3¼					
Tackle	1¾	D	1	6		
		I B S	1	6		
Backstays	3¼					2
Tackle	1¾	I B D	4	6		
Mast rope	2¼					
GAFF FORESAIL						
Throat halyards	3¾	I B D	2	10		
Tricing line	2	S	2	7	2	
Peak halyards	3¼	I B S	5	10		

NAMES OF RIGGING	Ropes or Chains, Size in Inches	Description of Blocks, etc.	Number	Inches	Hooks
GAFF FORESAIL (*Cont'd*)					
Purchase	2	I B S	1	7	
		D	1	7	
Downhaul	1¼	S	1	6	
Fore sheets	3	I B D	2	9	
		D	2	9	
FORE GAFF TOPSAIL					
Halyards	3	Trav.			
Sheet	2½	S	1	7	
Tackle	1¼	D	1	6	
		I B S	1	6	
Downhaul	1½	S	1	5	
MAINMAST					
Shrouds	6½	D E	4	8	
Pendants	5	S C	2	8	
Runners	4				2
Falls	2½	D	2	8	
		I B S	2	8	
Jumper stays	6½	I B S C	2	11	
Runners	4½				2
Tackles	2¾	I B D	4	9	
BOOM MAINSAIL					
Main halyards	3¾	I B D	2	10	
Peak halyards	3¾	I B S	5	10	
Purchase	2	D	1	7	
		I B S	1	7	
Downhaul	1¼	S	1	6	
Tack tackle	2	I B D	1	6	
		I B S	1	6	
Tack tricing line	2	S	2	7	2
Reef earings	4½				
Lacing	1				
MAIN BOOM					
Topping lifts	5	I B S C	2	9	2
Tackle falls	2½	D	2	8	
		I B S	2	8	
Boom sheets	3½	D	2	12	
		S C	1	8	

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